

Roi (*Cephalopholis argus*) in West Hawai'i

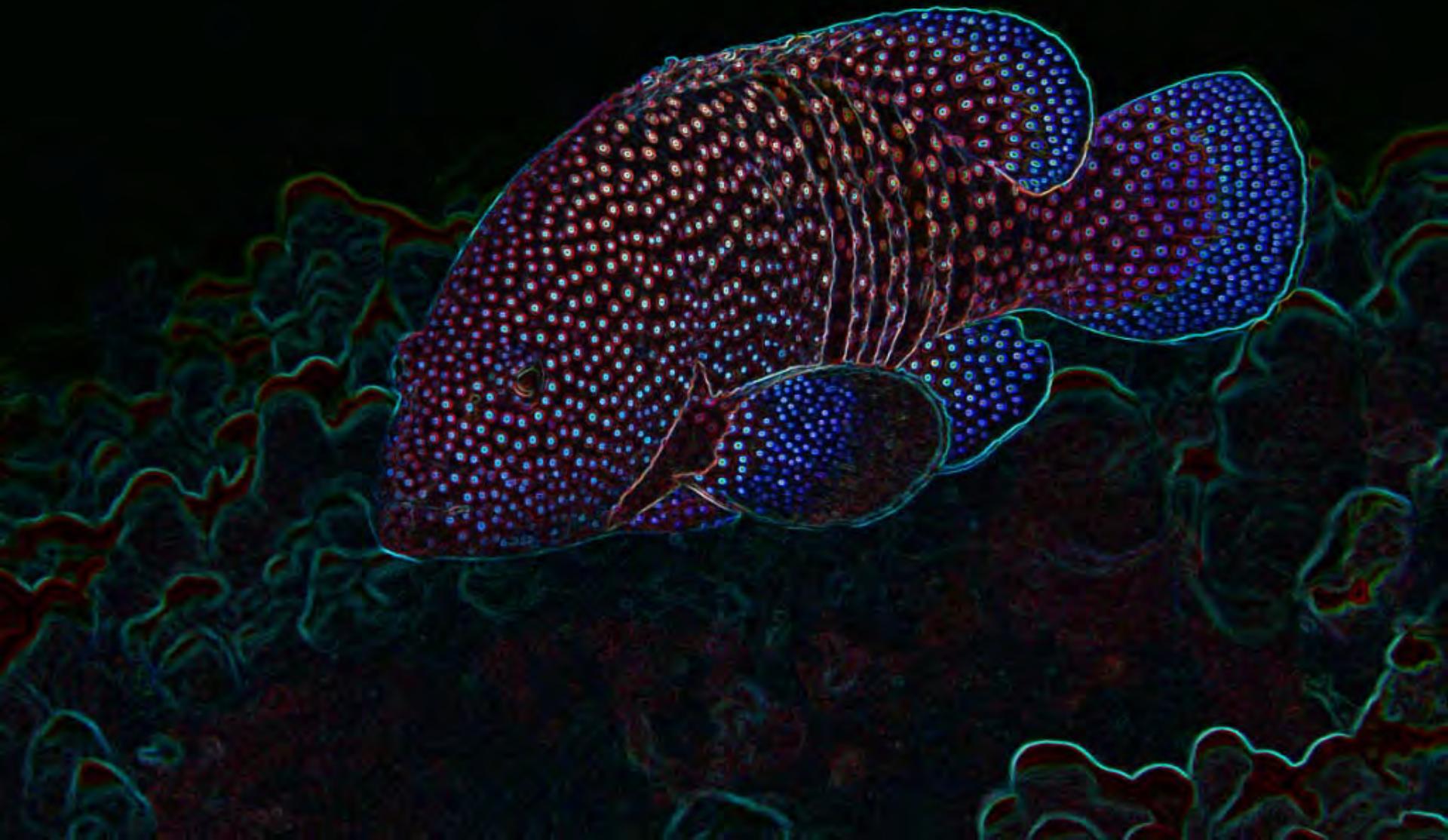
Insights on Impacts from Monitoring Data



William J. Walsh
Hawai'i Division of Aquatic Resources

The Ultimate
Predator

???





Roi Round-up

Roi-a-thon

Kill Roi day



22 pc.

21 pc.

20 pc.

1. KIMI WEEVER

1. LANCE OTSUBO

2. DEAN KAWAMURA

BRYAN NAKAMOTO

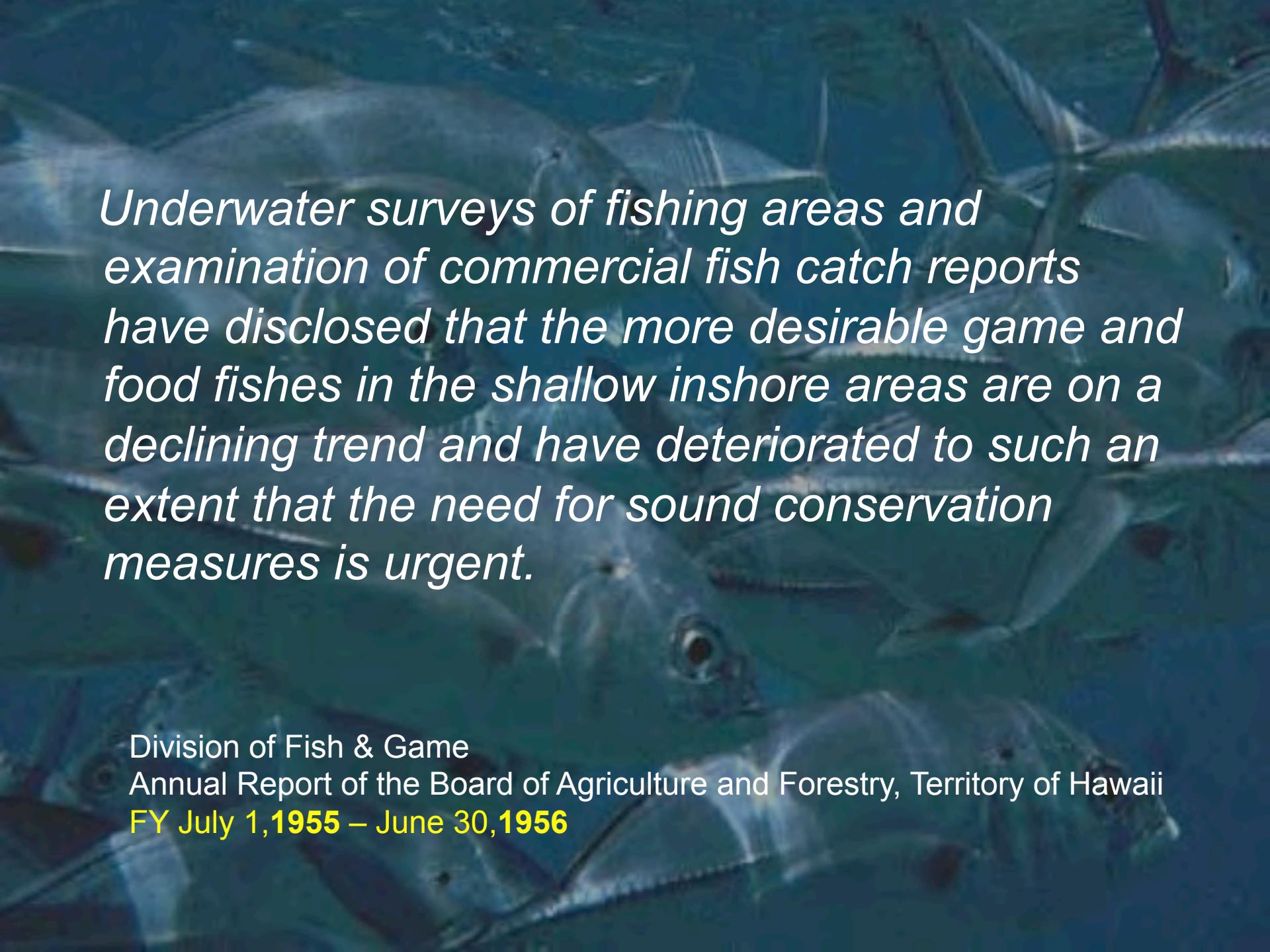
3. DARRELL TANAKA

KAPENA SEGUNDO

Intentional Aquatic Introductions to Hawai'i

>40 species introduced by 1955

1871-1949	Eastern Oyster
1876-1929	Chinook Salmon
1897	Largemouth Bass
1920	Manila Clam
1920	Striped Bass
1920-1937	Japanese Clam
1923-1939	Crayfish
1926-1935	Samoan Crab
1925	Ayu
1927-1928	Black Abalone
1932	California Anchovy
1951	Giant Clam

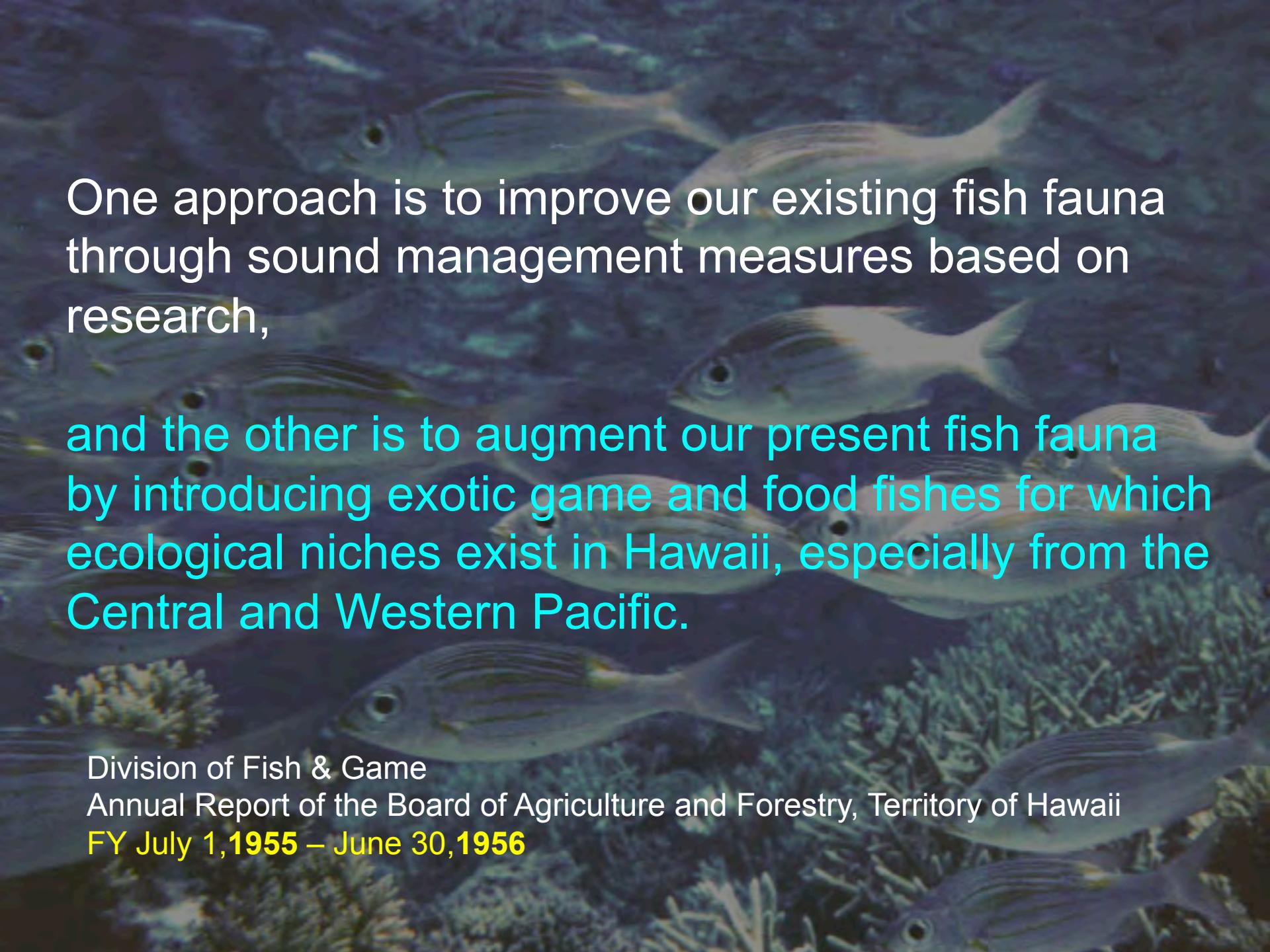


Underwater surveys of fishing areas and examination of commercial fish catch reports have disclosed that the more desirable game and food fishes in the shallow inshore areas are on a declining trend and have deteriorated to such an extent that the need for sound conservation measures is urgent.

Division of Fish & Game

Annual Report of the Board of Agriculture and Forestry, Territory of Hawaii

FY July 1, 1955 – June 30, 1956



One approach is to improve our existing fish fauna through sound management measures based on research,

and the other is to augment our present fish fauna by introducing exotic game and food fishes for which ecological niches exist in Hawaii, especially from the Central and Western Pacific.

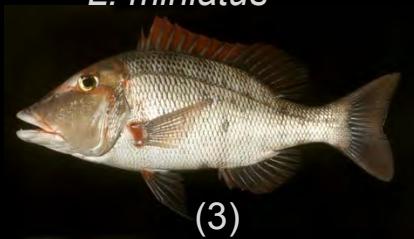
Division of Fish & Game
Annual Report of the Board of Agriculture and Forestry, Territory of Hawaii
FY July 1, 1955 – June 30, 1956

E. fasciatus



(51)

L. miniatus



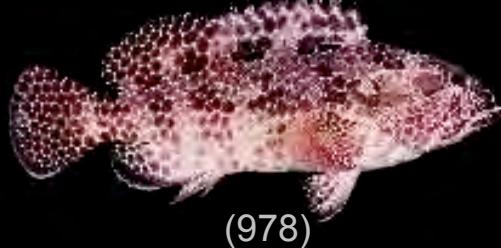
(3)

C. urodetata



(1,811)

E. hexagonatus



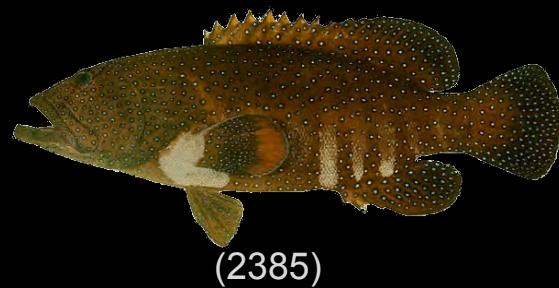
(978)

L. fulvus



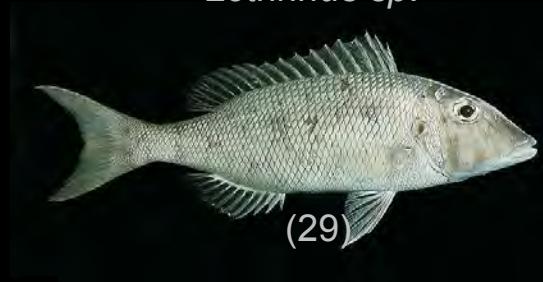
(2303)

C. argus



(2385)

Lethrinus sp.



(29)

E. merra



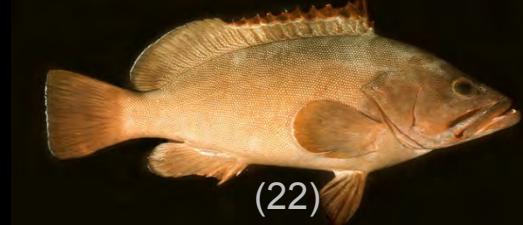
(1,634)

L. gibbus



(177)

E. irroratus



(22)

L. guttatus



(3,439)



1955-Marquesas (<12), 1956-Moorea (239), 1958-Marquesas (23), 1961-Canton Is. (248), 1961 Moorea (1782)



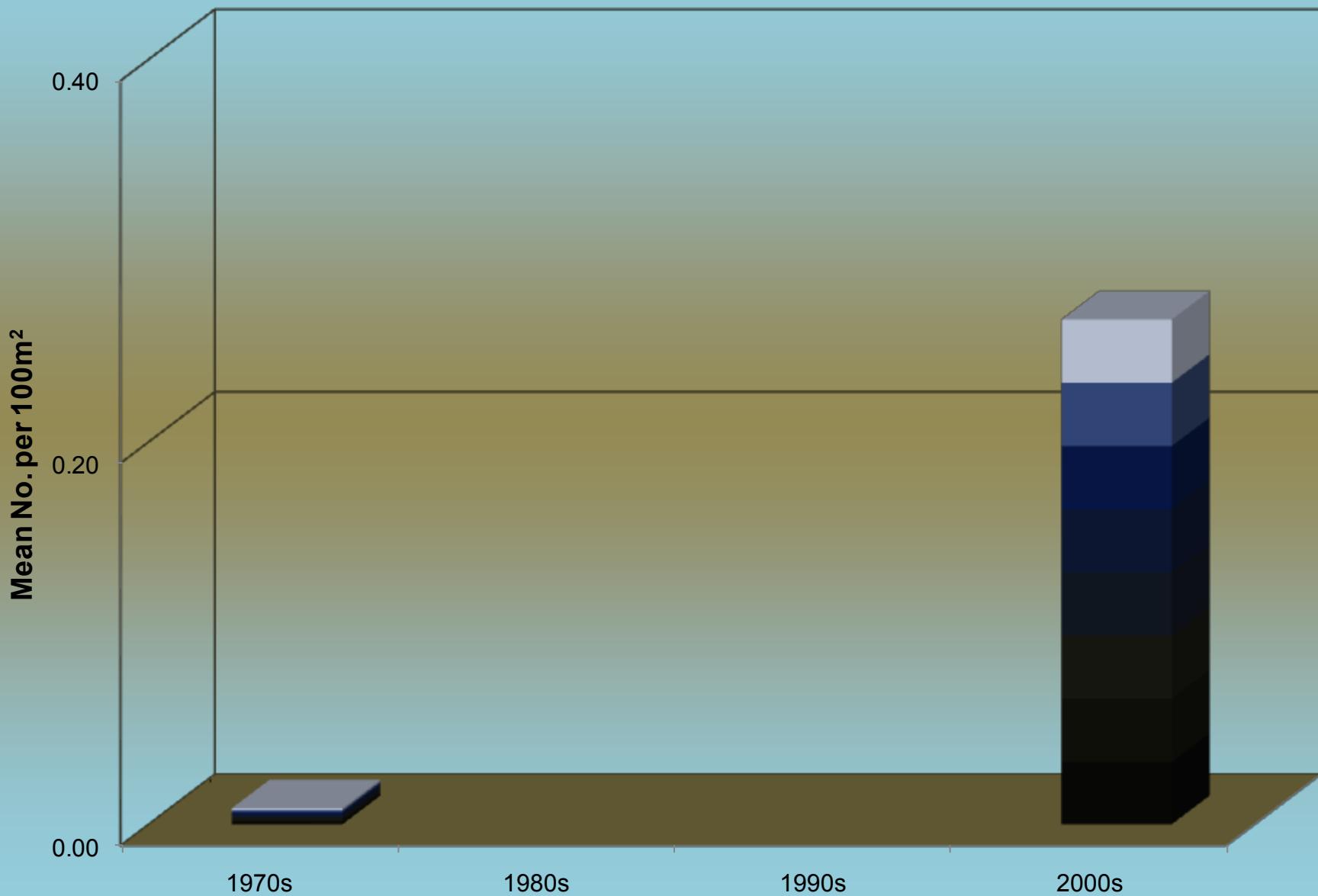
1956-Moorea (171), 1956-Moorea (400),
1961-Moorea (1814)



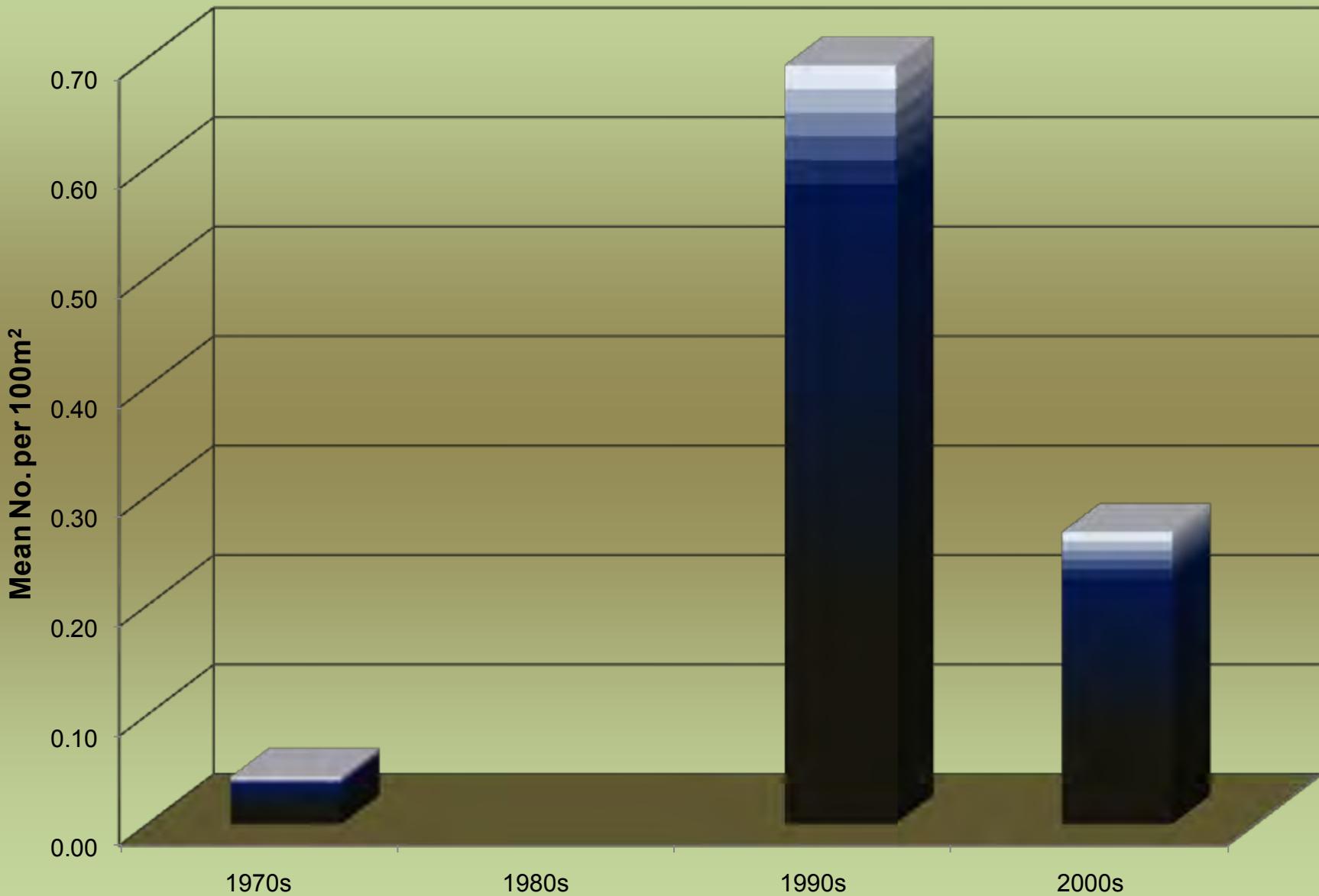
1955-Marquesas (<12), 1958-Marquesas (2435)
1961-Moorea (728)

Hawai'i 'Oahu

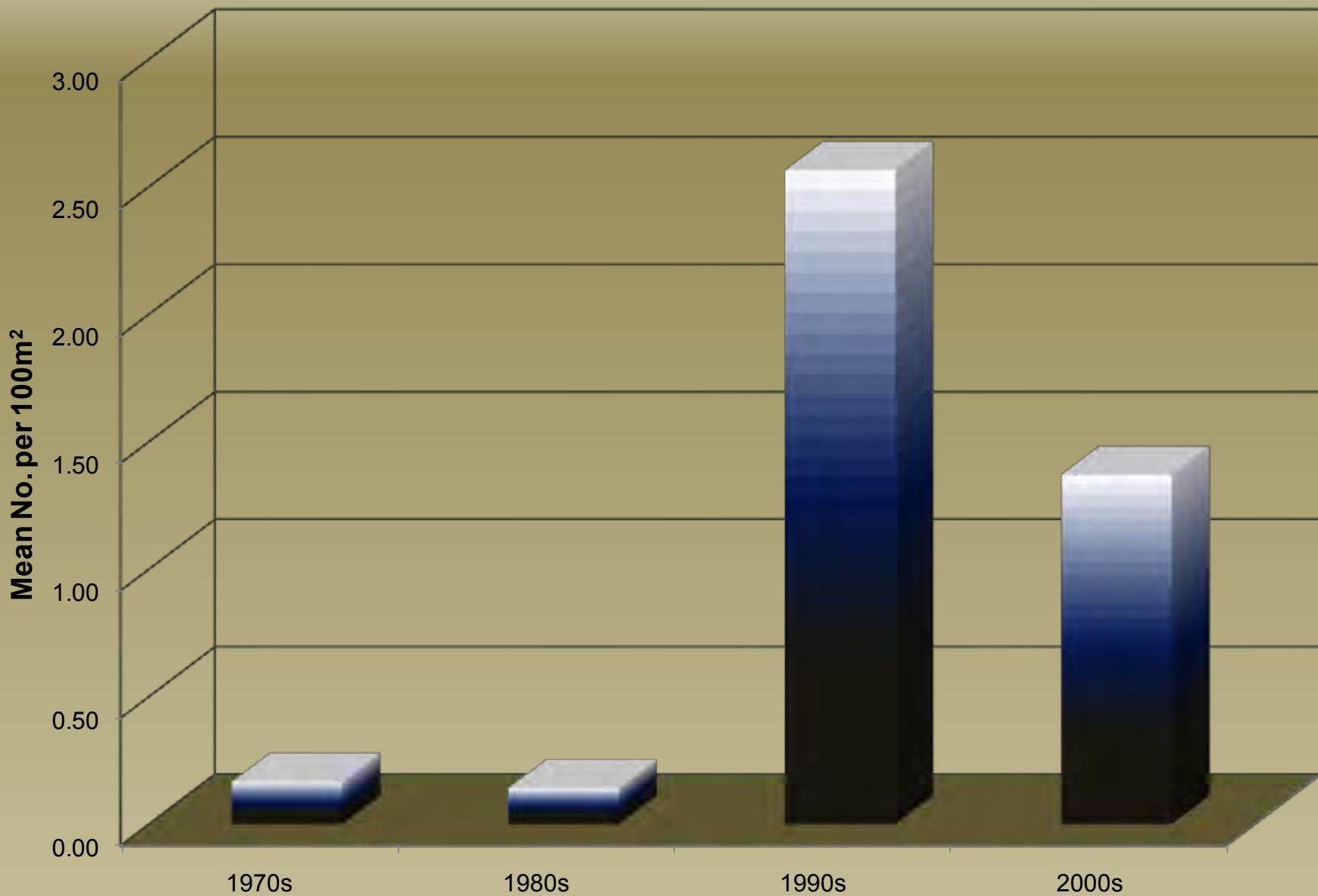
Roi Abundance at Puakō



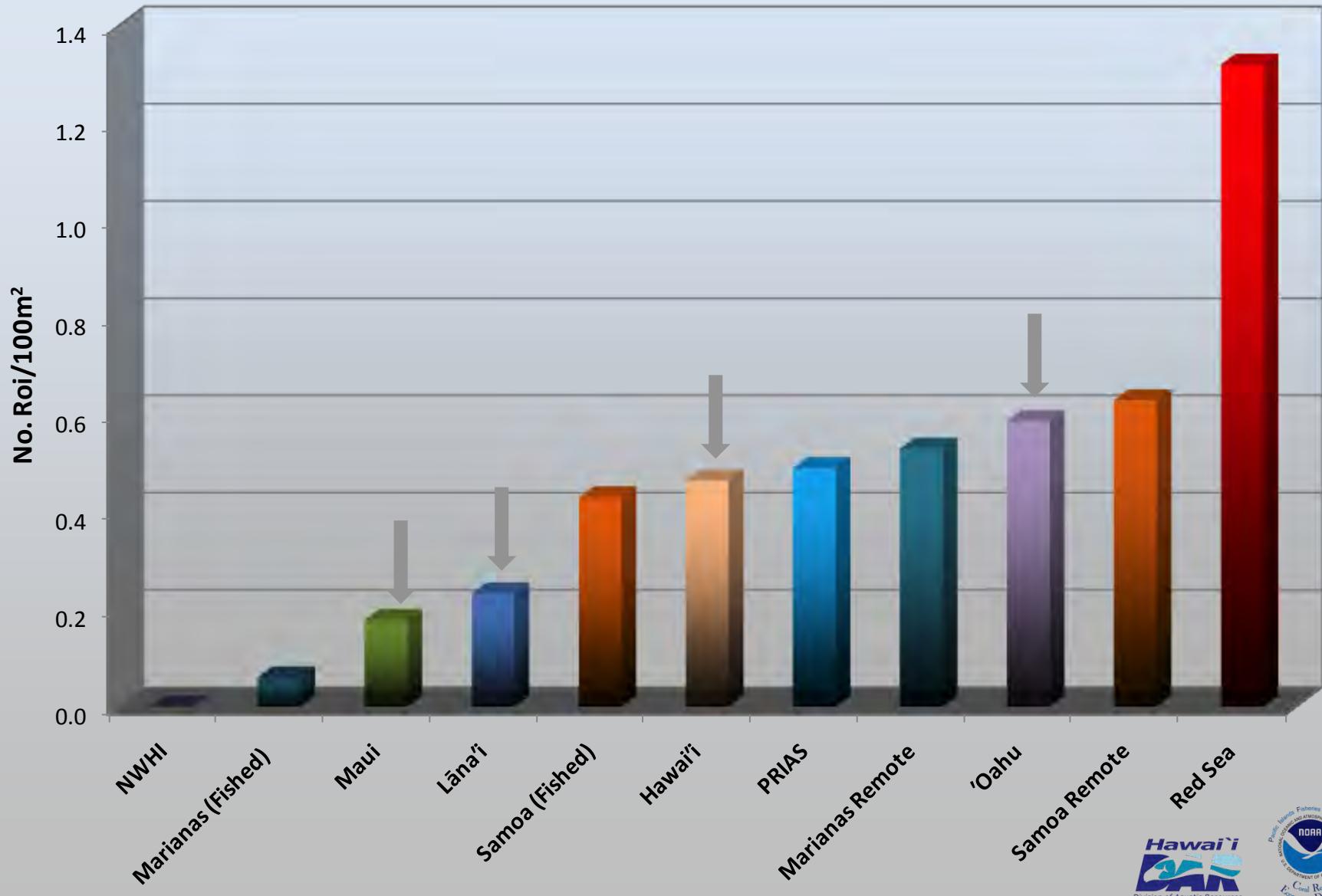
Roi Abundance at Hōnaunau



Roi Abundance at Ke'ei

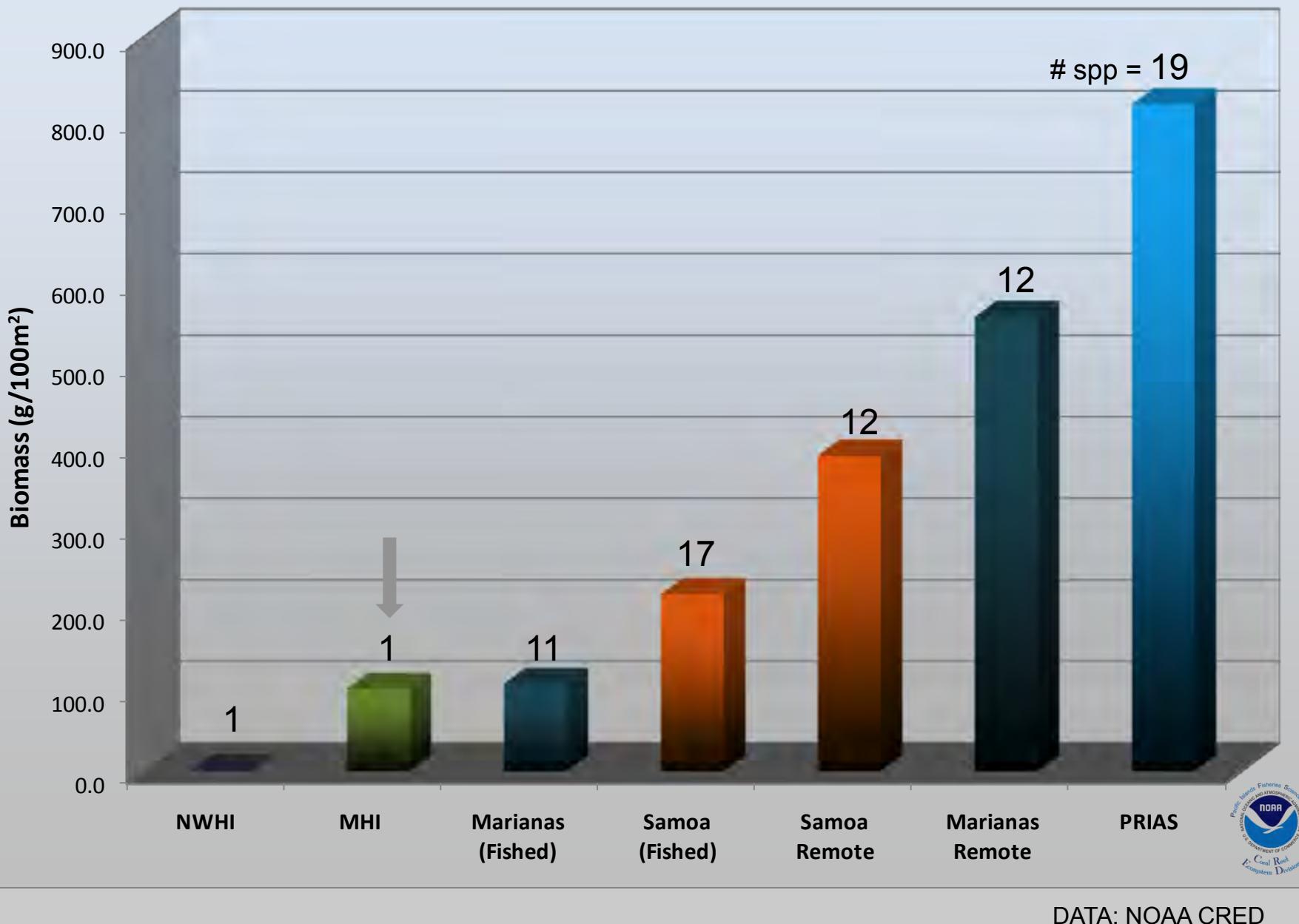


Roi Density at Various Locations

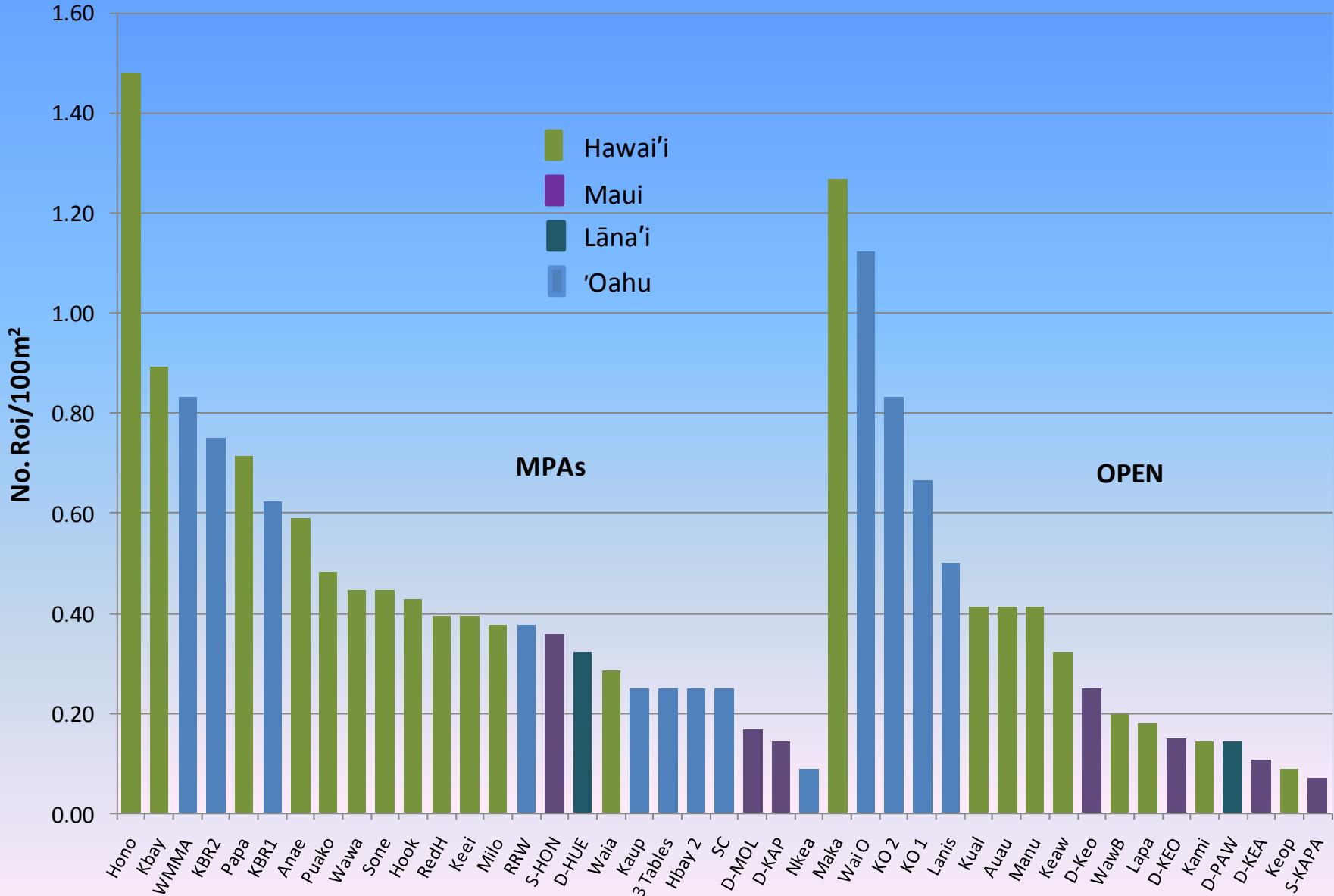


DATA: DAR & NOAA CRED

Grouper Biomass at Various Locations



Roi Abundance at DAR Monitoring Sites



WHAP Study Sites

- Open Sites
- MPA Sites
- FRA Sites
- ▲ 100 Fathom Contour
- Fish Replenishment Areas



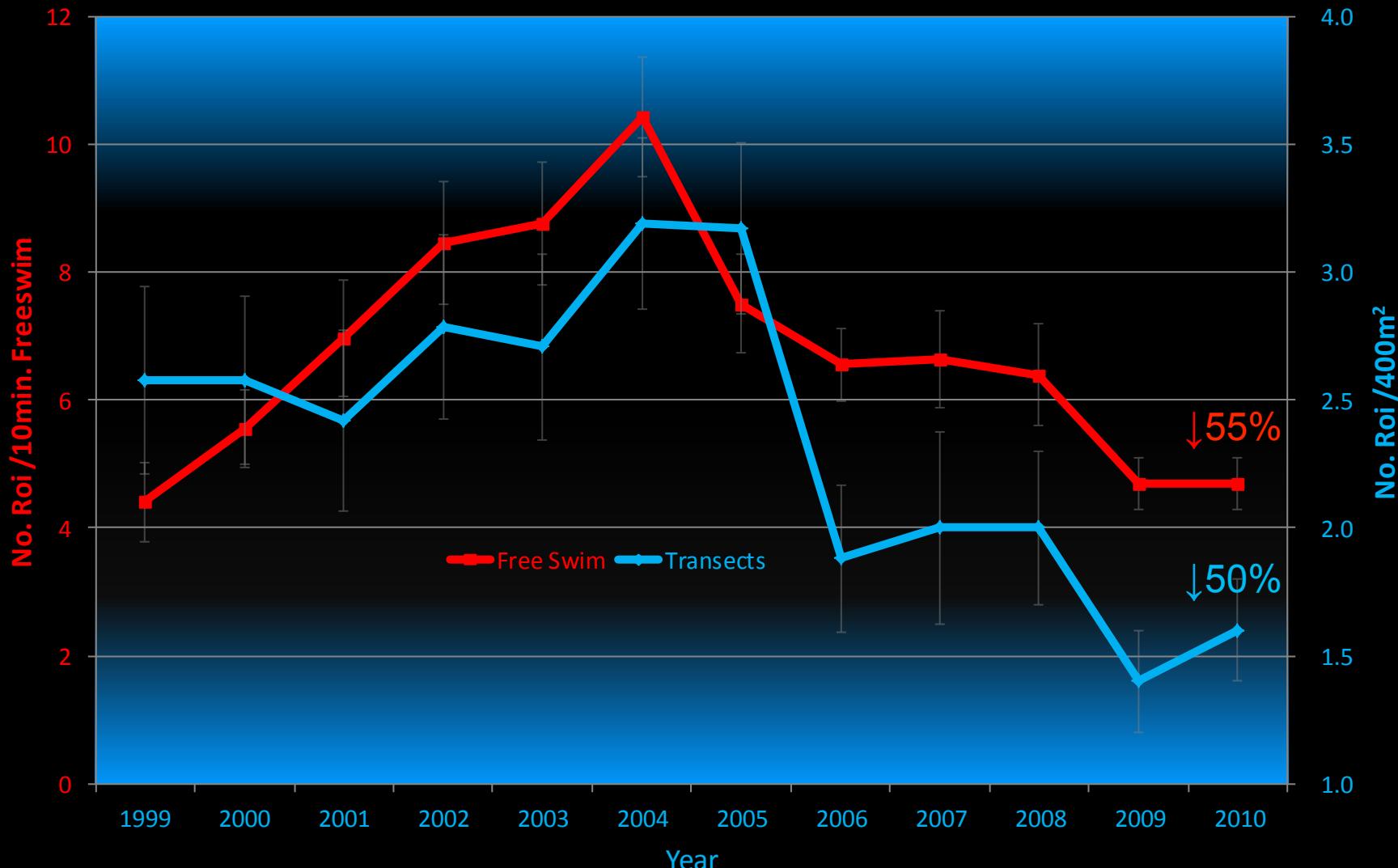
Division of Aquatic Resources
Department of Land and Natural Resources
State of Hawaii
"Fish for the Future"

Map Projection: UTM Zone 4 1:600,000
Data Provided by: State of Hawaii
Map Created by: Lisa Wedding 6/27/02



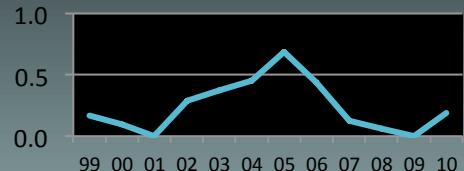
8 0 8 16 Miles

Cephalopholis argus (Roi) Abundance in West Hawai'i

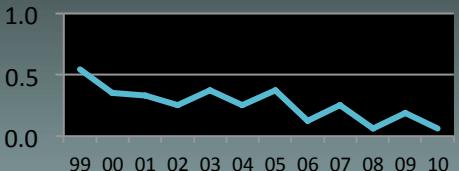


Cephalopholis argus (Roi) Abundance on W. HI Transects

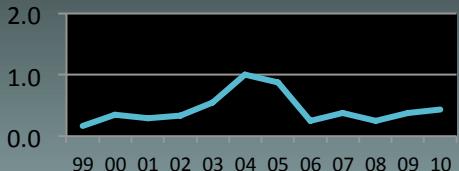
#1



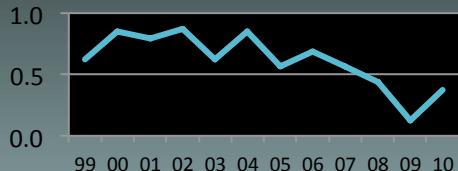
#2



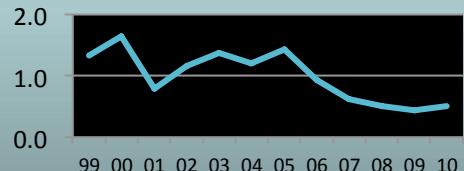
#3



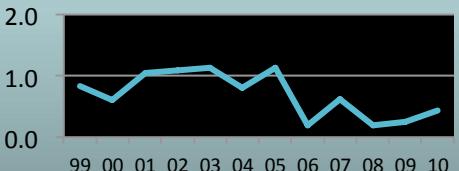
#4



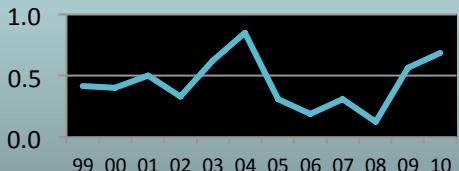
#5



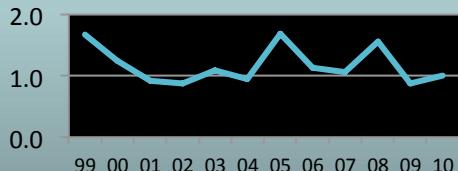
#6



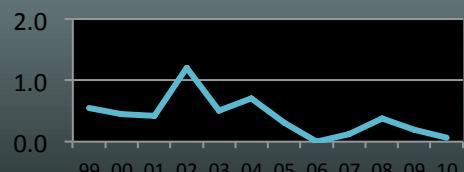
#7



#8



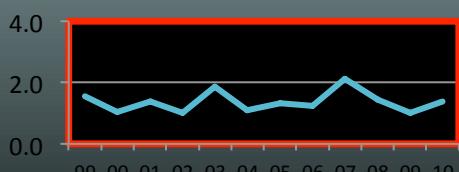
#9



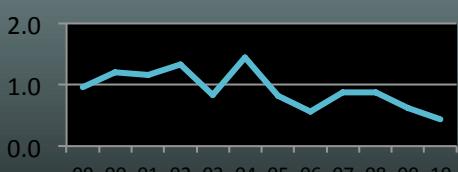
#10



#11

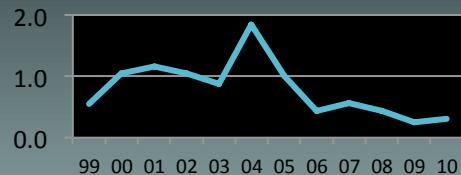


#13

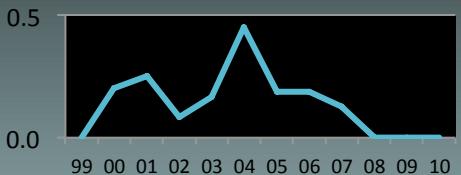


Cephalopholis argus (Roi) Abundance on W. HI Transects

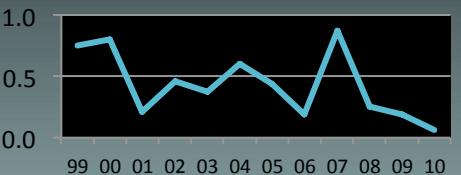
#14



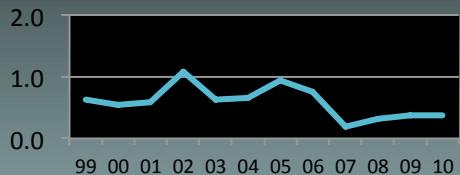
#15



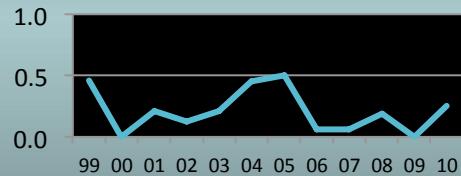
#16



#17



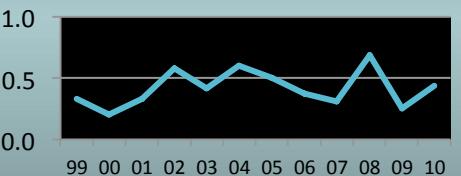
#18



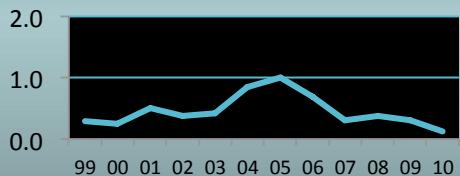
#19



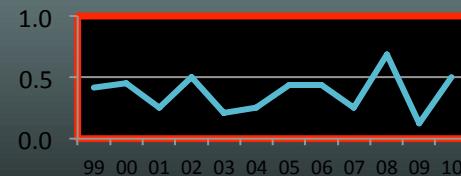
#20



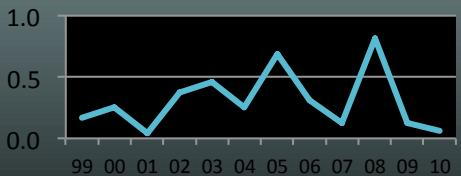
#21



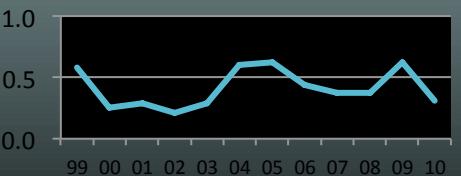
#22



#23



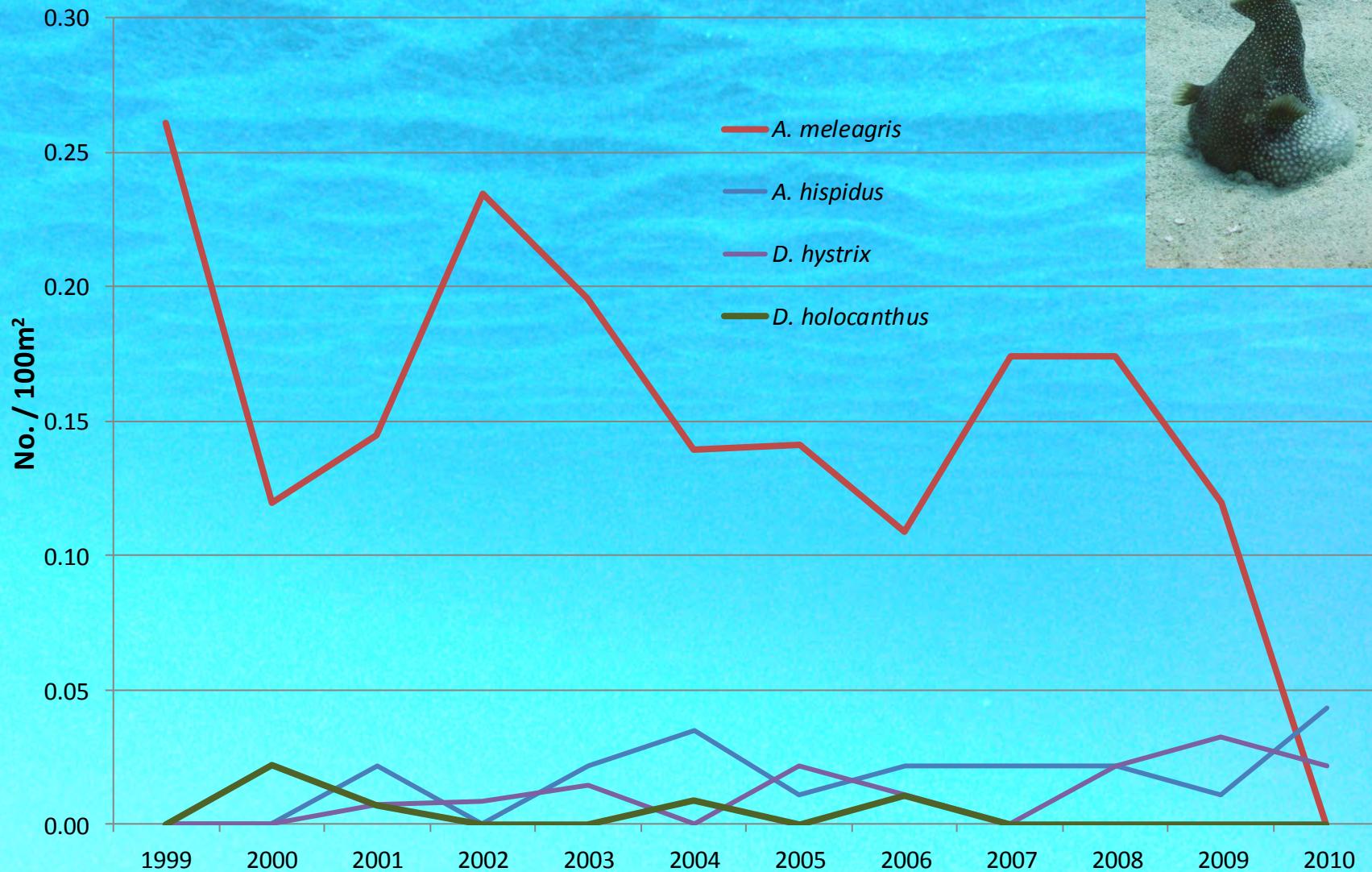
#24

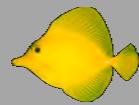


**9 Different species of
dead or dying fishes
Reported or collected in West Hawai'i**

Pufferfish Abundance on WHAP Transects

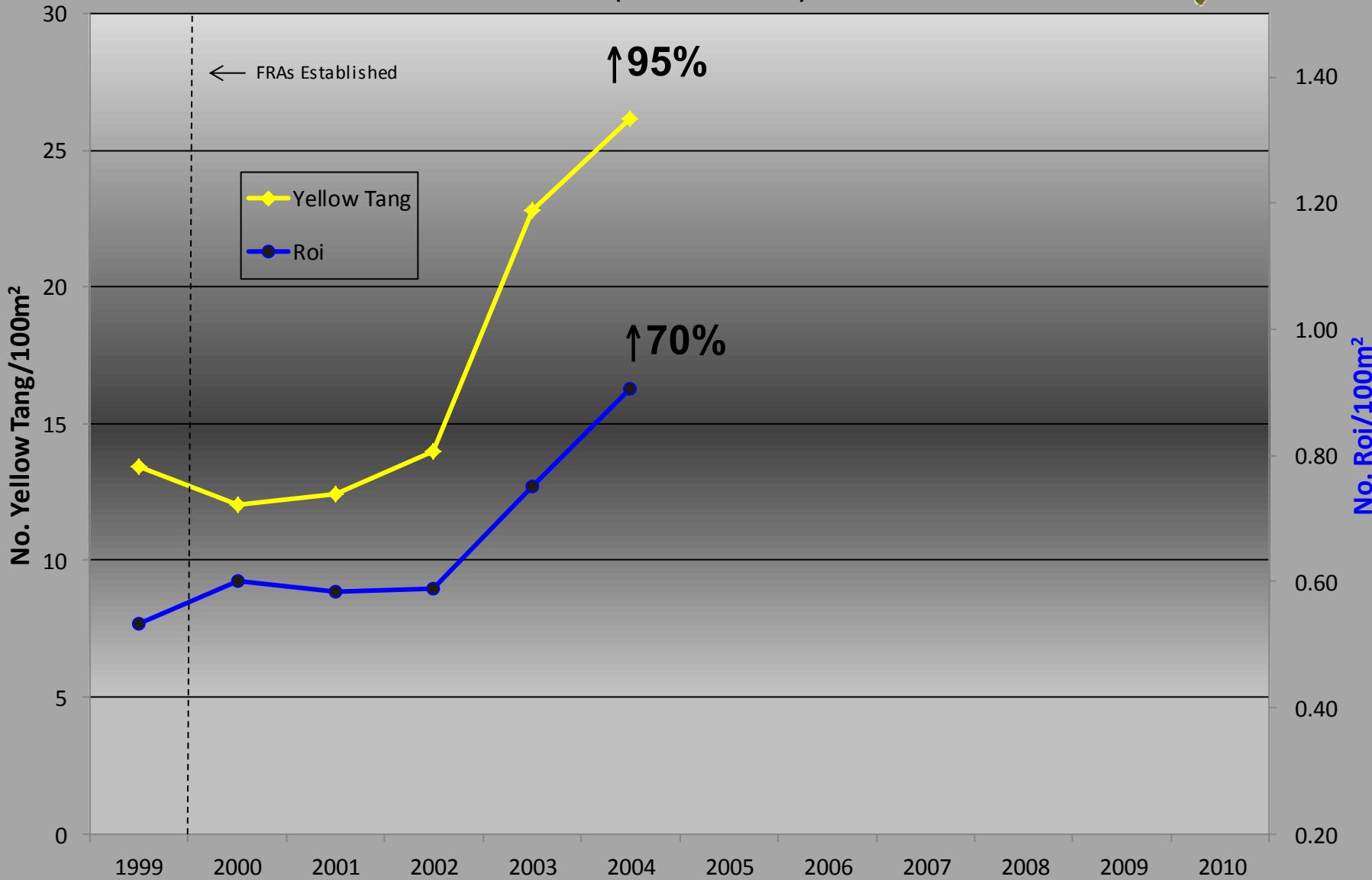
N=1,288 surveys

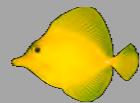




Yellow Tang vs. Roi Abundance in FRAs

(YOY not included)

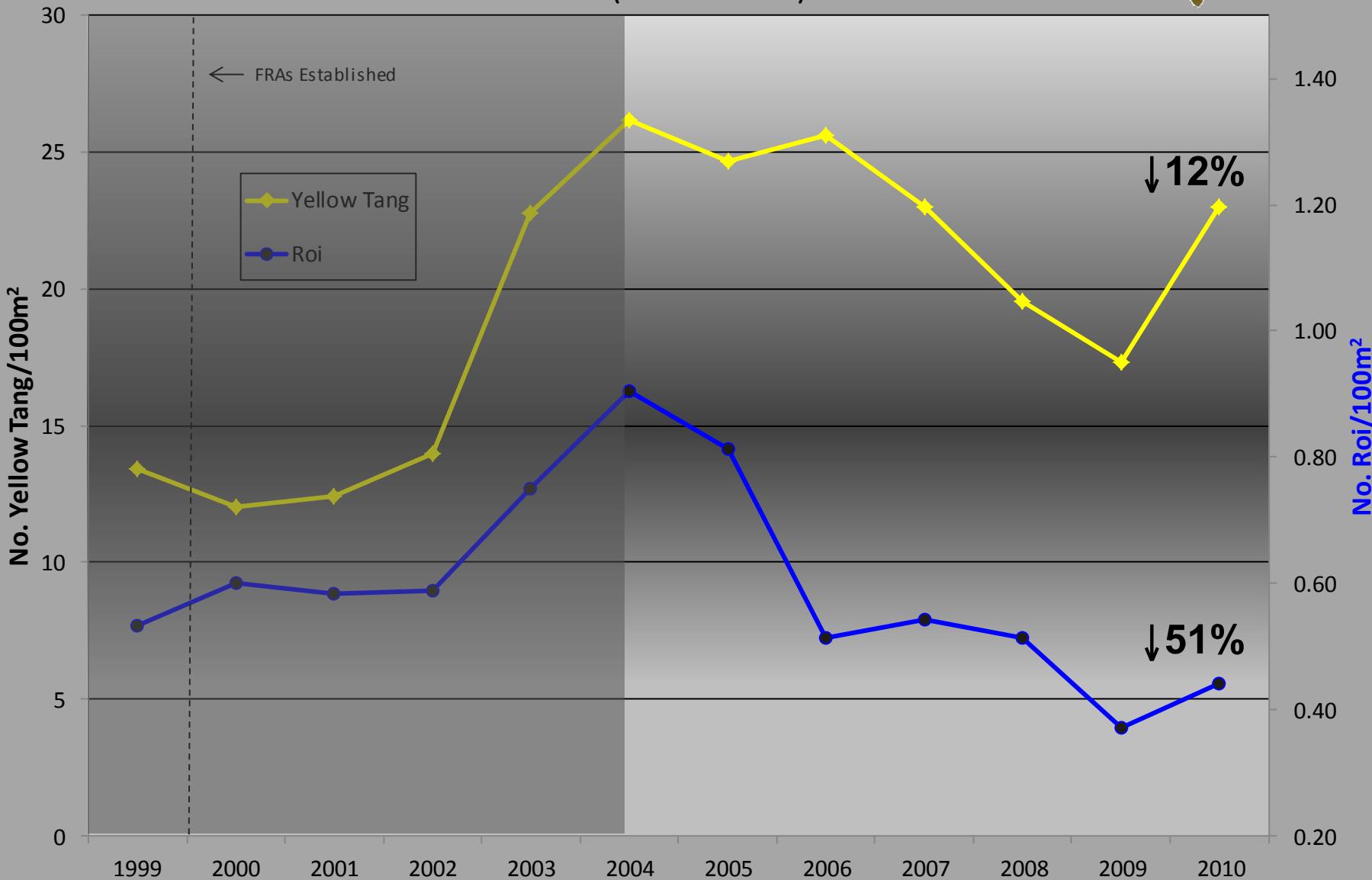




Yellow Tang vs. Roi Abundance in FRAs

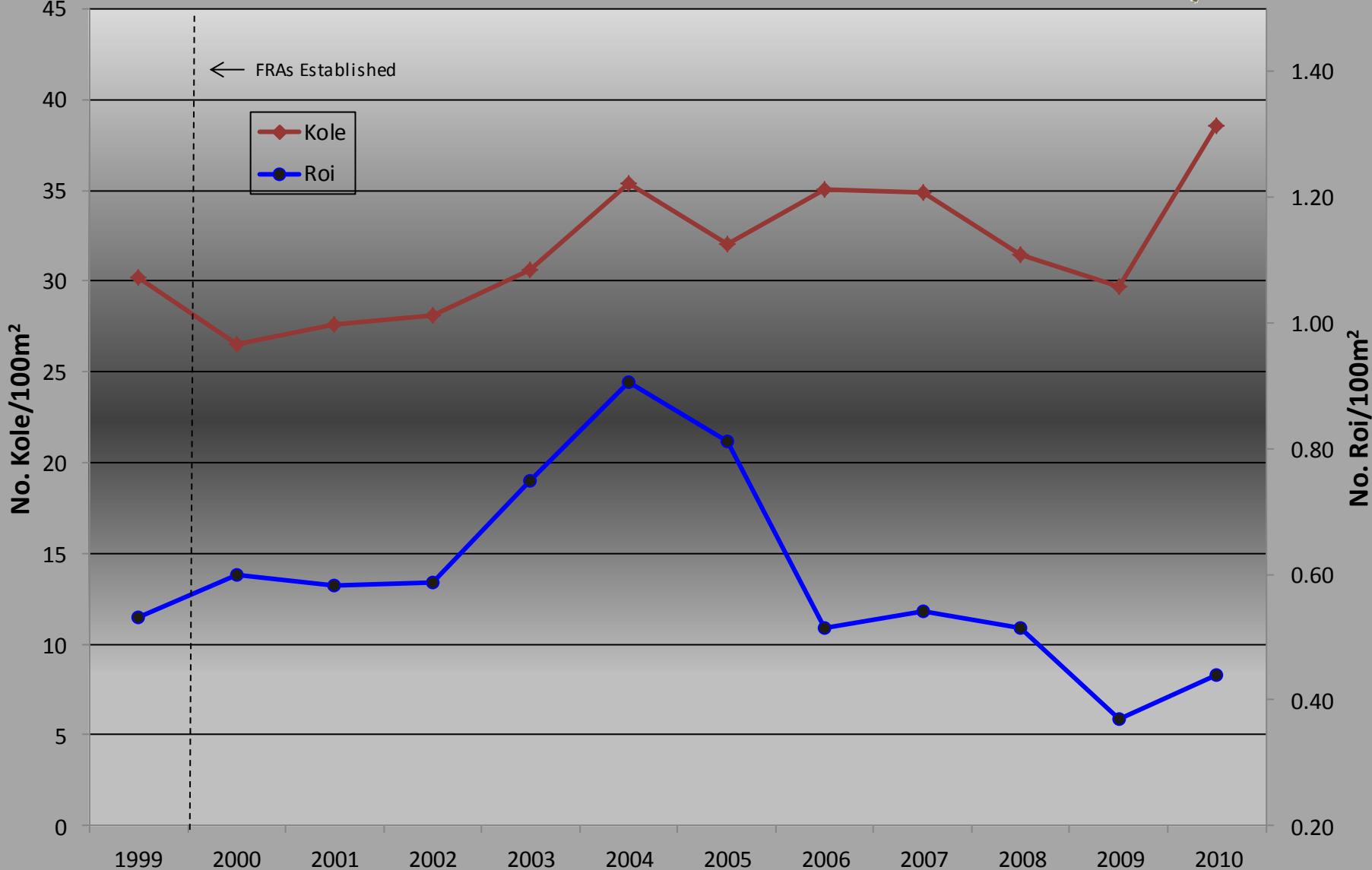
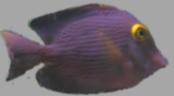


(YOY not included)



Kole vs. Roi Abundance in FRAs

(YOY excluded)

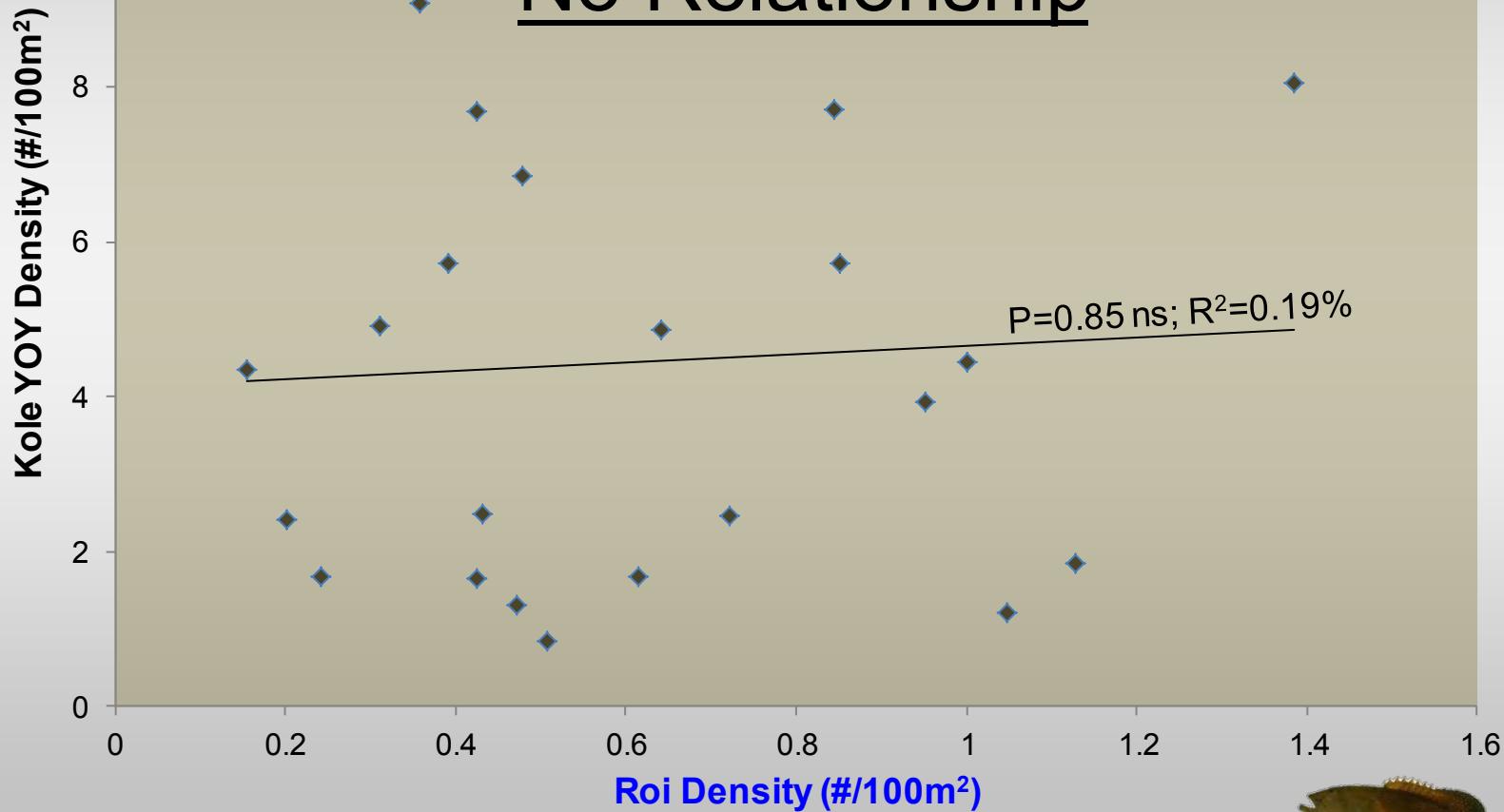




Kole YOY vs. Roi (West Hawai'i 2002-2009)

N=736 site surveys

No Relationship





Yellow Tang YOY vs. Roi (West Hawai'i 2002-2009)

N=736 site surveys

Yellow Tang YOY Density (#/100m²)

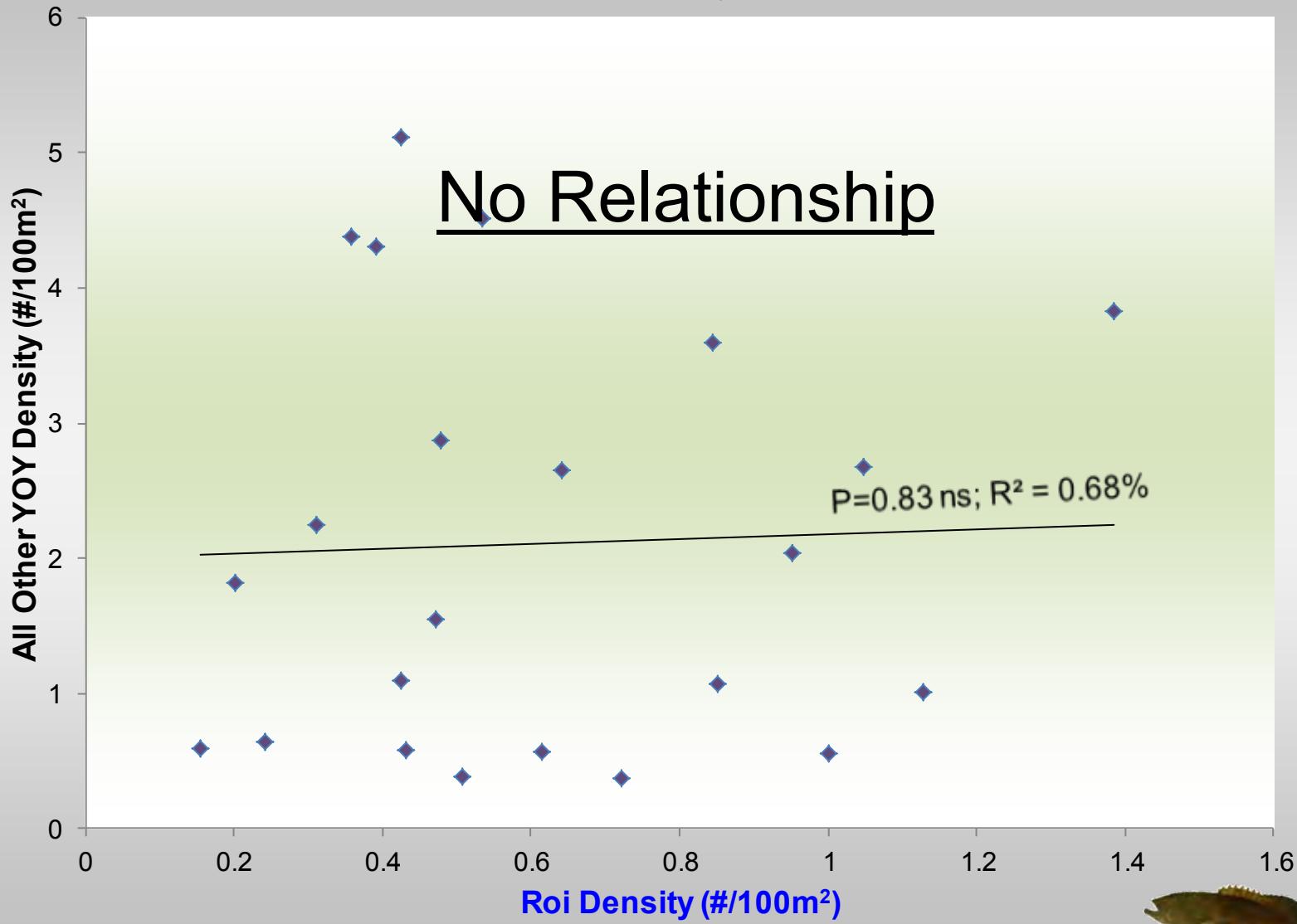
No Relationship

P=0.27 ns; R² = 5.67%

Roi Density (#/100m²)

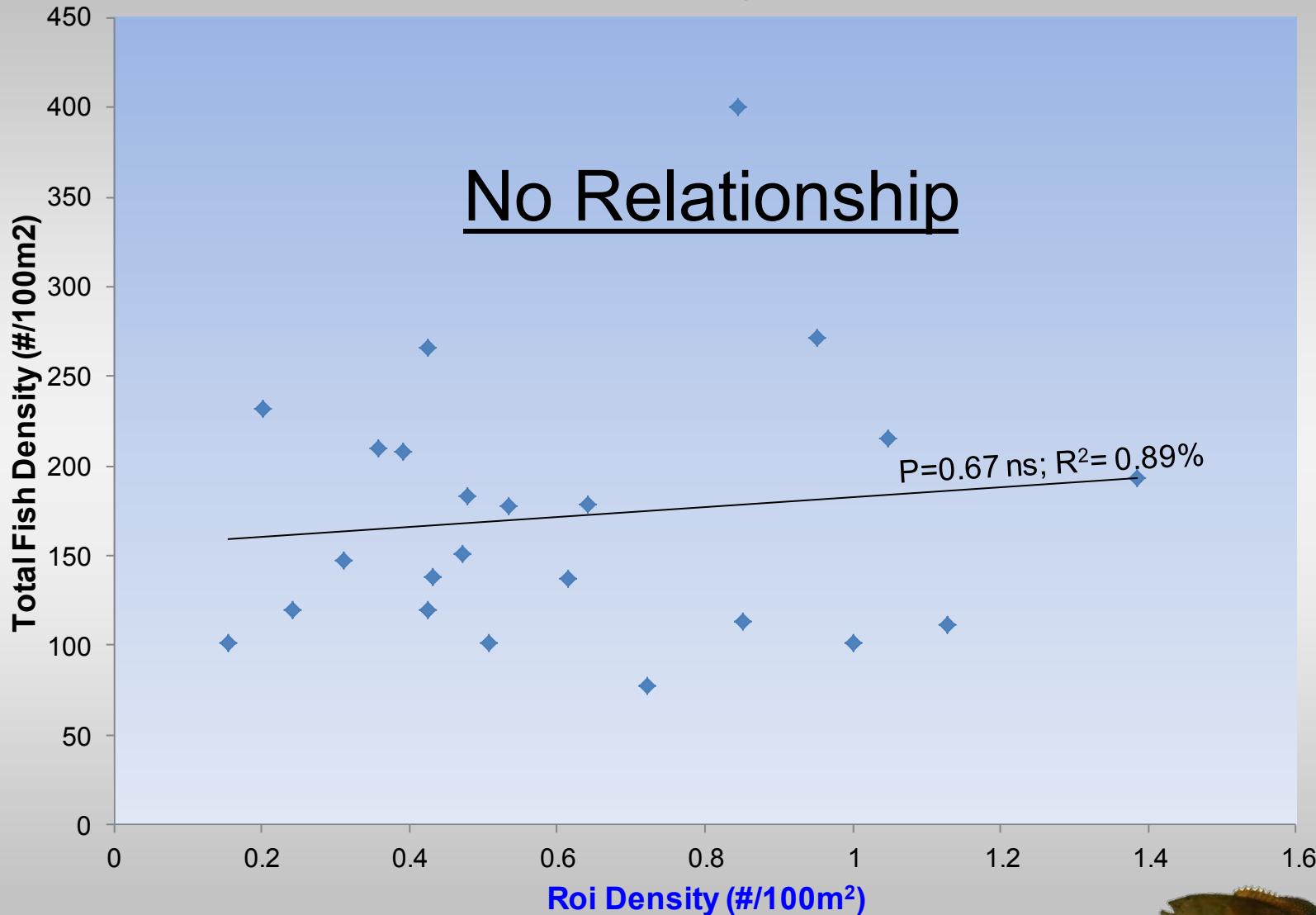


Other YOY vs. Roi (West Hawai'i 2002-2009)
N=736 site surveys

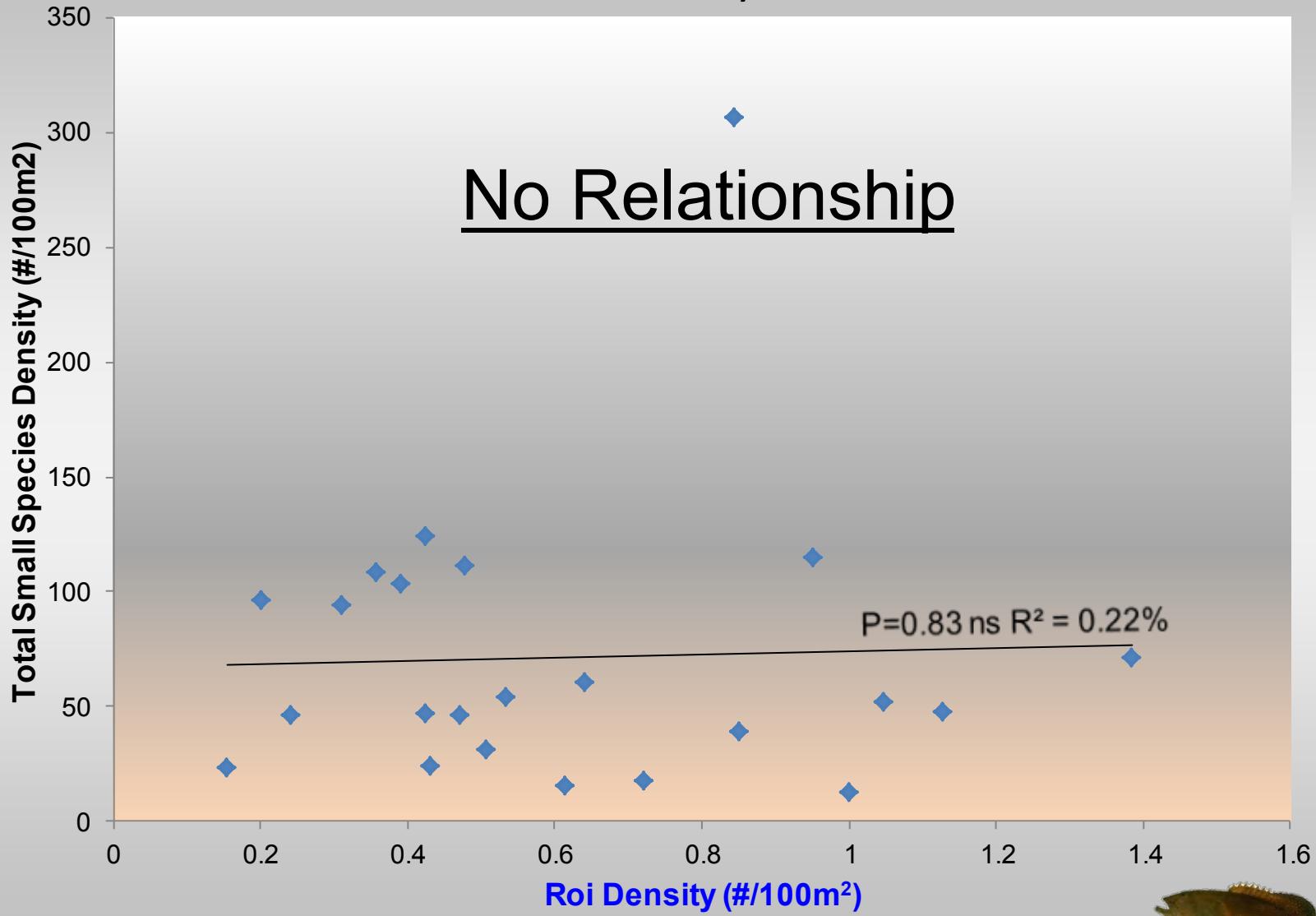


All Fish vs. Roi (West Hawai'i 2002-2009)

N=736 site surveys

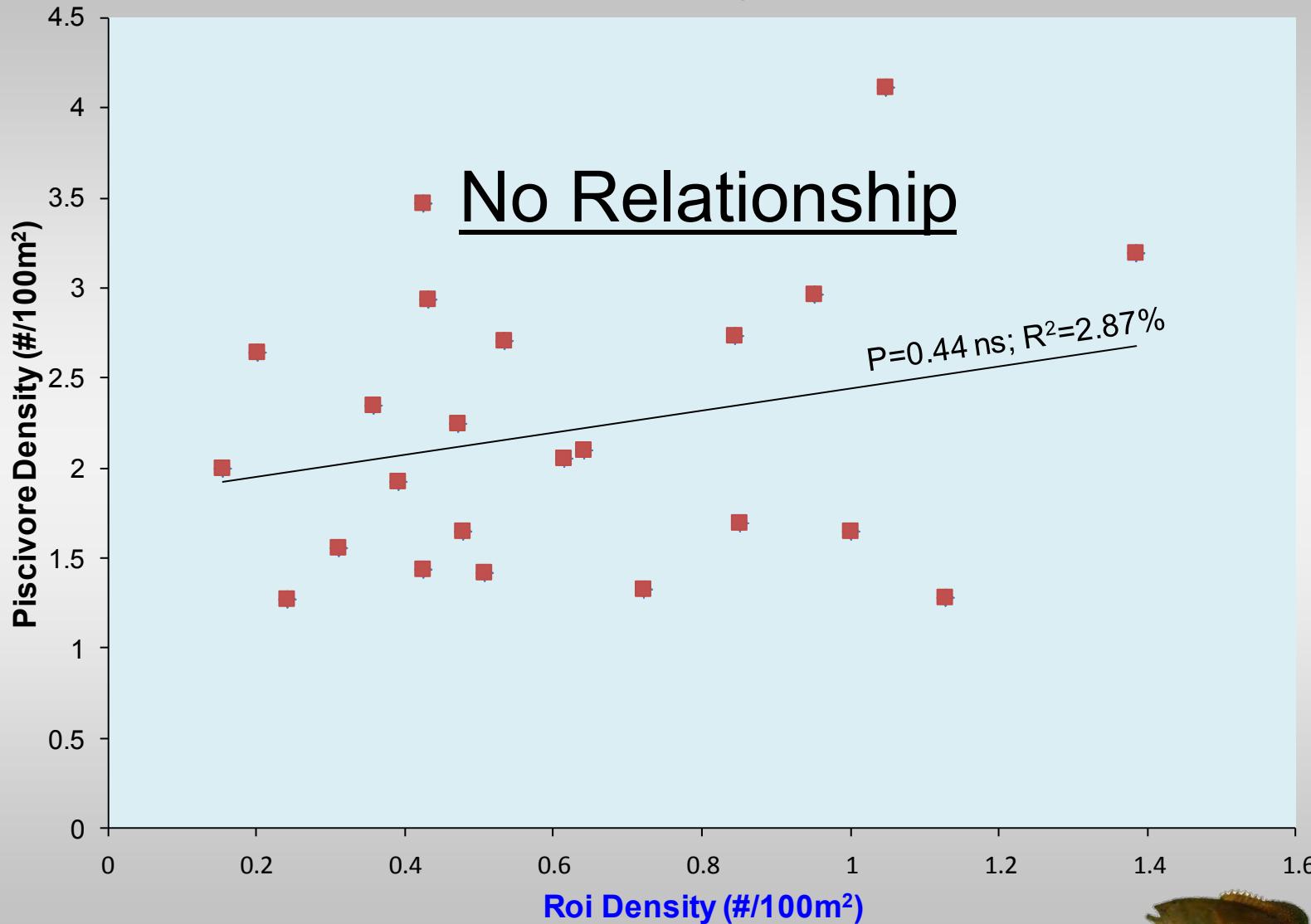


All Prey Fish ($\leq 15\text{cm TL}$) vs. Roi (West Hawai'i 2003-2009)
N=736 site surveys



All Piscivores vs. Roi (West Hawai'i 2002-2009)

N=736 site surveys

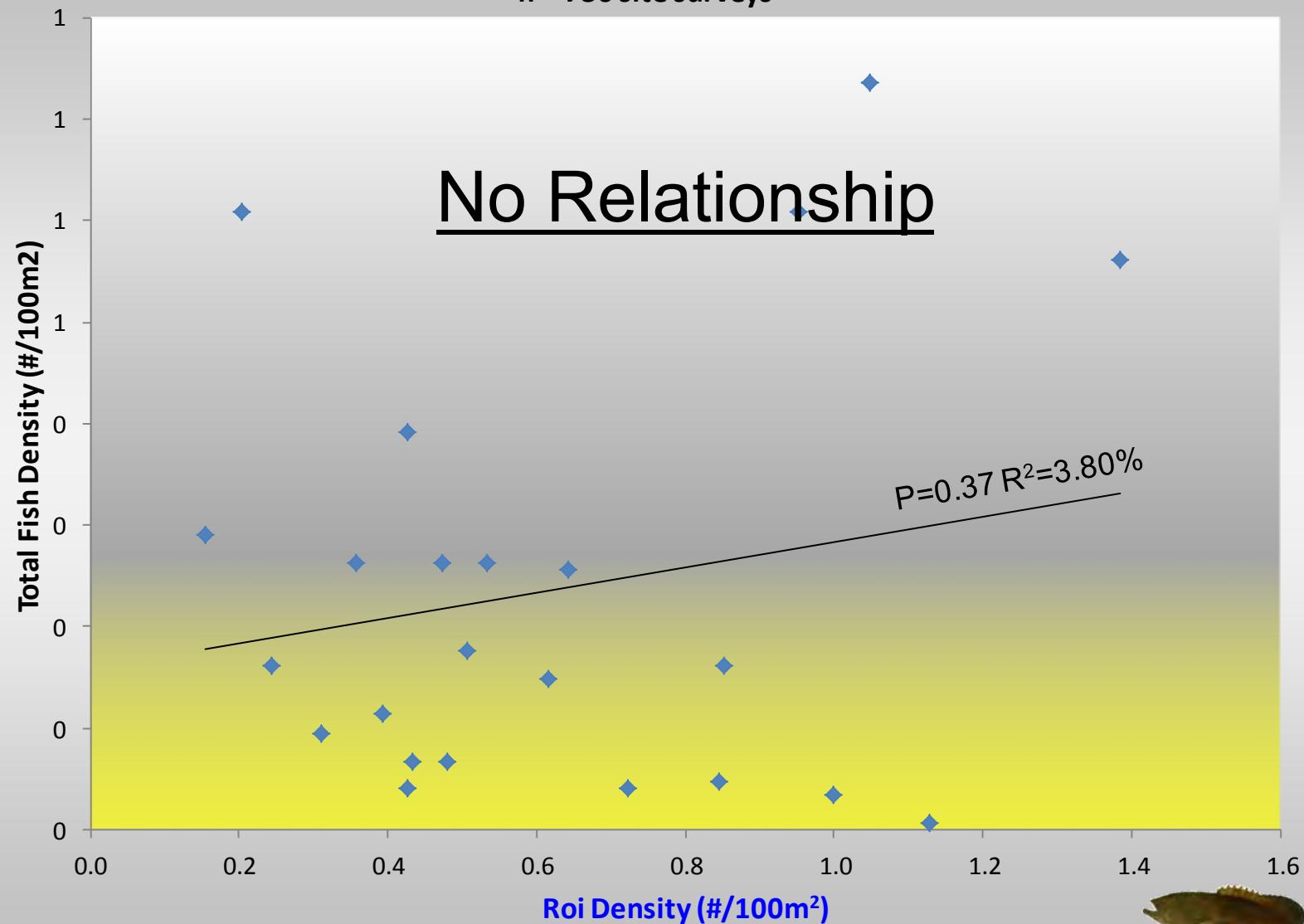




Small trumpet fish preyed upon by roi more frequently
Than their natural abundance would suggest – Dierking et. al. 2008

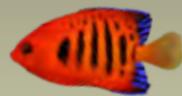
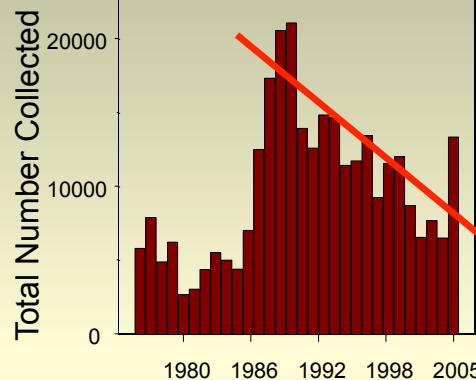
Trumpetfish vs. Roi (West Hawaii 2002-2009)

n = 736 site surveys

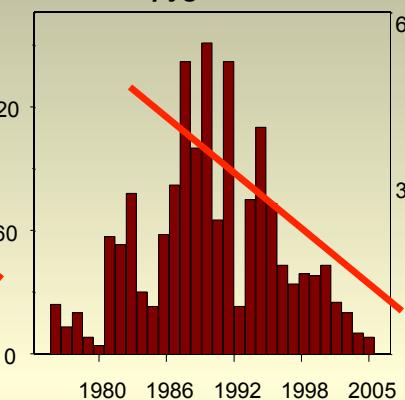




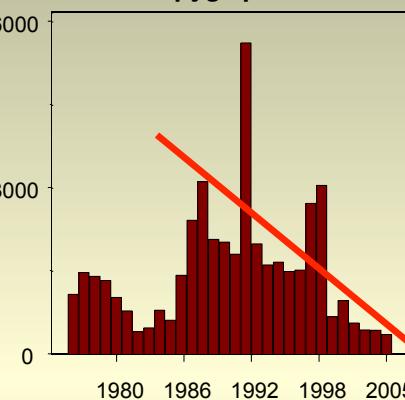
Acanthurus achilles



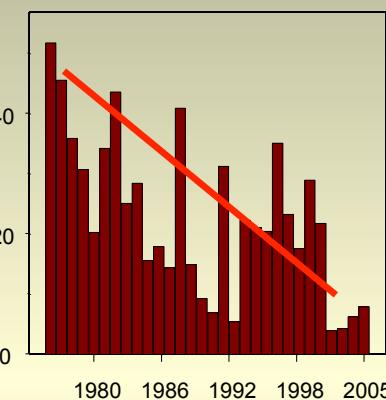
Centropyge loricula



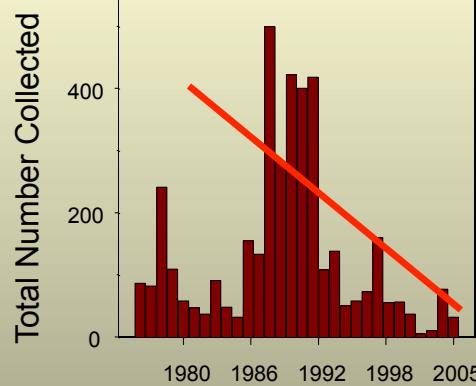
Centropyge potteri



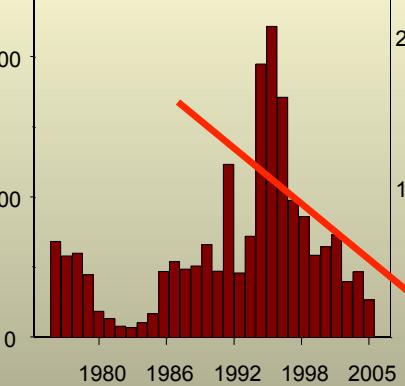
Desmoholacanthus arcuatus



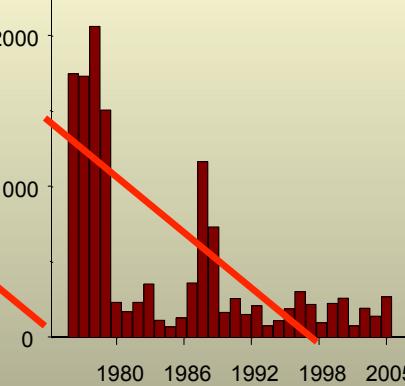
Chaetodon kleinii



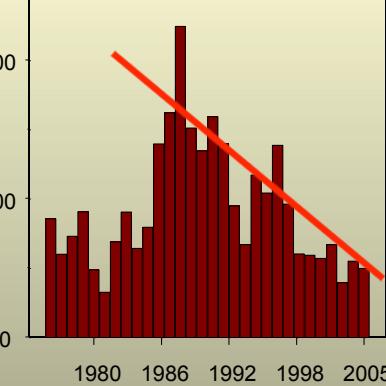
Chaetodon multicinctus



Chaetodon unimaculatus



Forcipiger flavissimus





Conclusions

Although introduced in the 1950's roi populations in West Hawai'i did not markedly increase until the 1990's

Roi populations in West Hawai'i have declined by 50% since 2005 likely due to a die-off in summer of 2006

Roi abundance does not appear to negatively affect the population size of the two most heavily collected aquarium species

There are no significant relationships between roi abundance and a variety of reef fish population parameters in West Hawai'i



Average daily ration = 0.8% of body weight

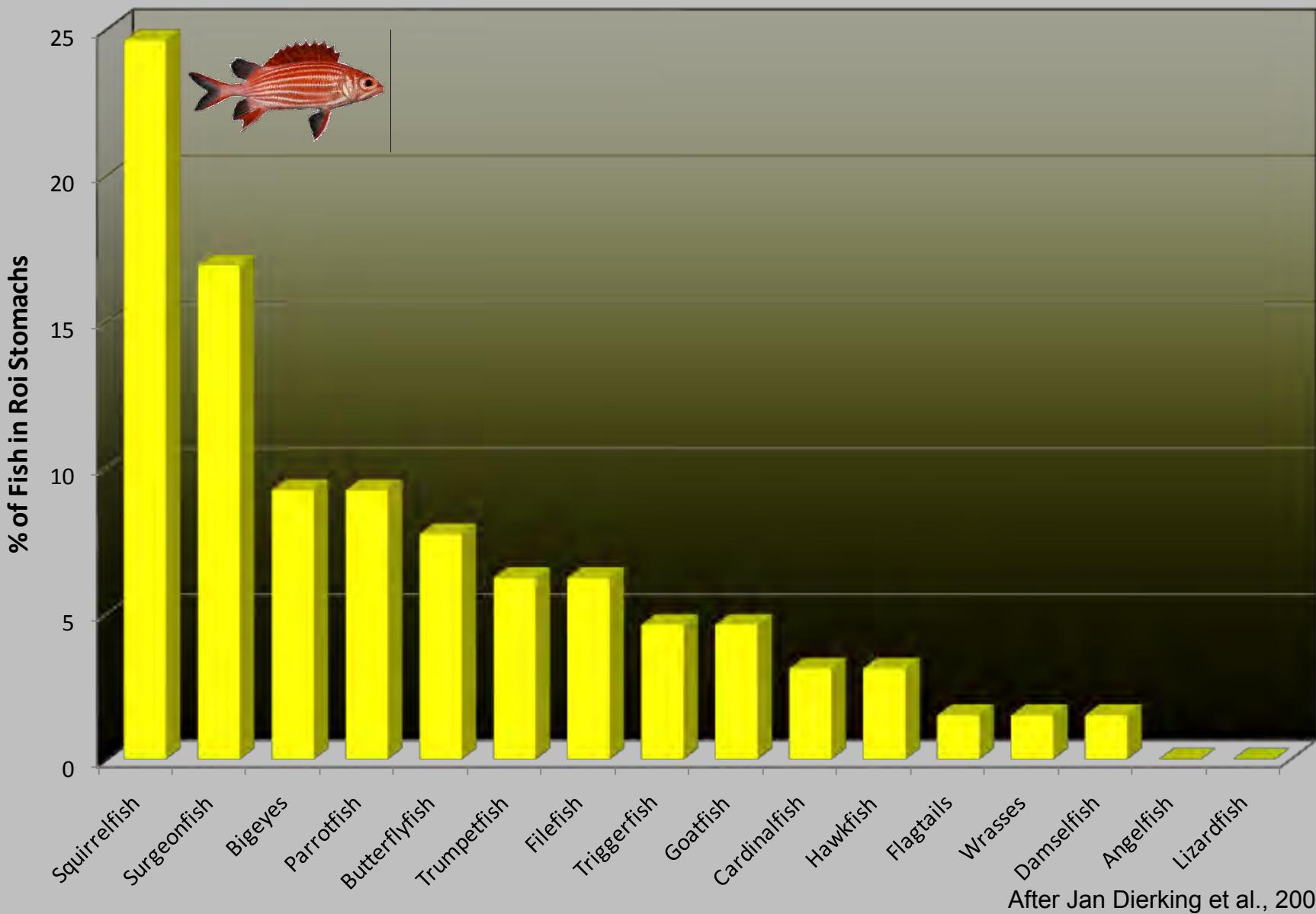
A Roi weighing 1.3 lbs. eats

2.8 fish/week weighing 1.17 oz.

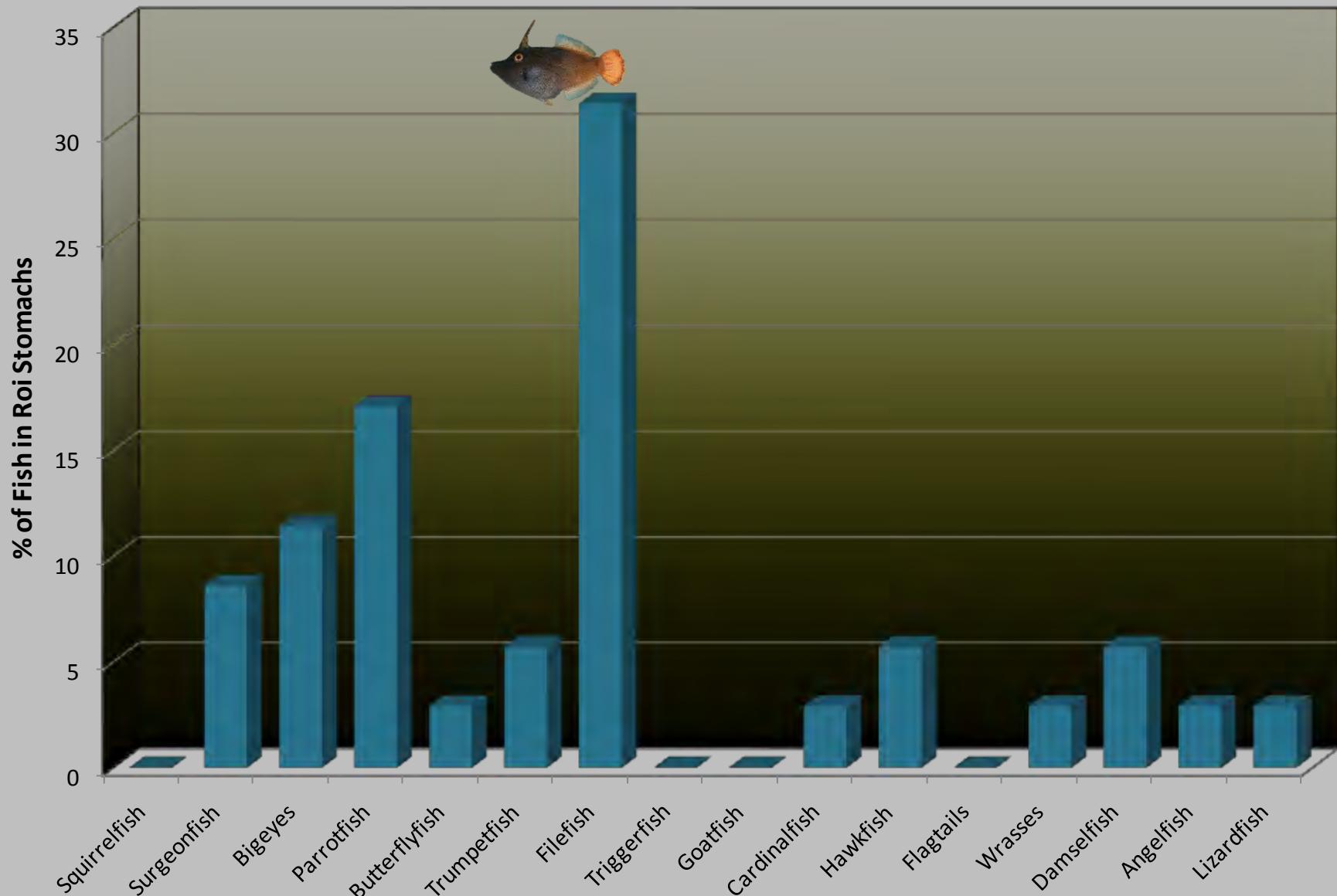
or 146 fishes/year weighing 60.8 oz.

It would consume its own weight 2.9X per year

Roi Prey Fish Species on Hawai'i (n=179)

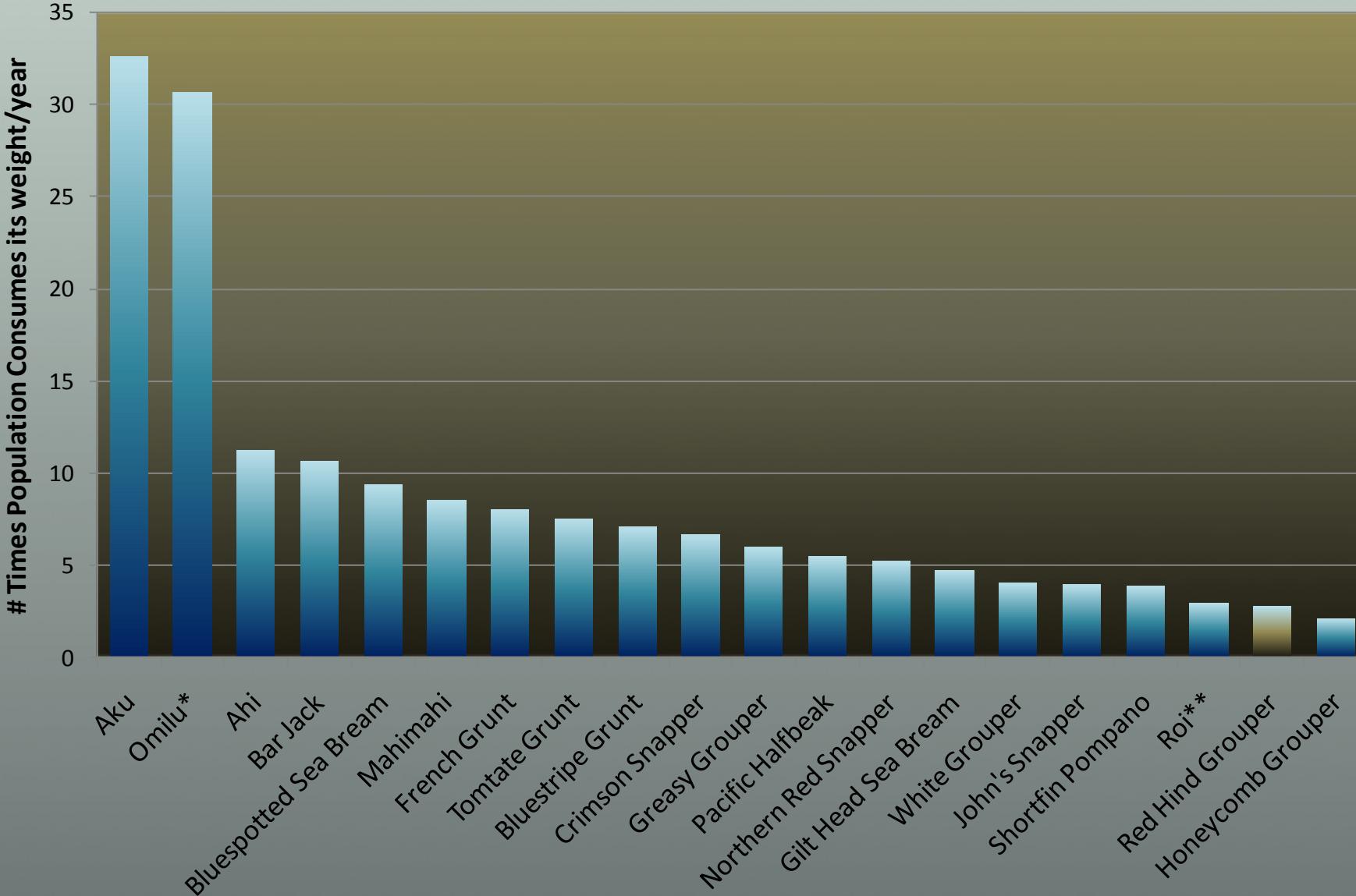


Roi Prey Fish Species on 'Oahu (n=106)



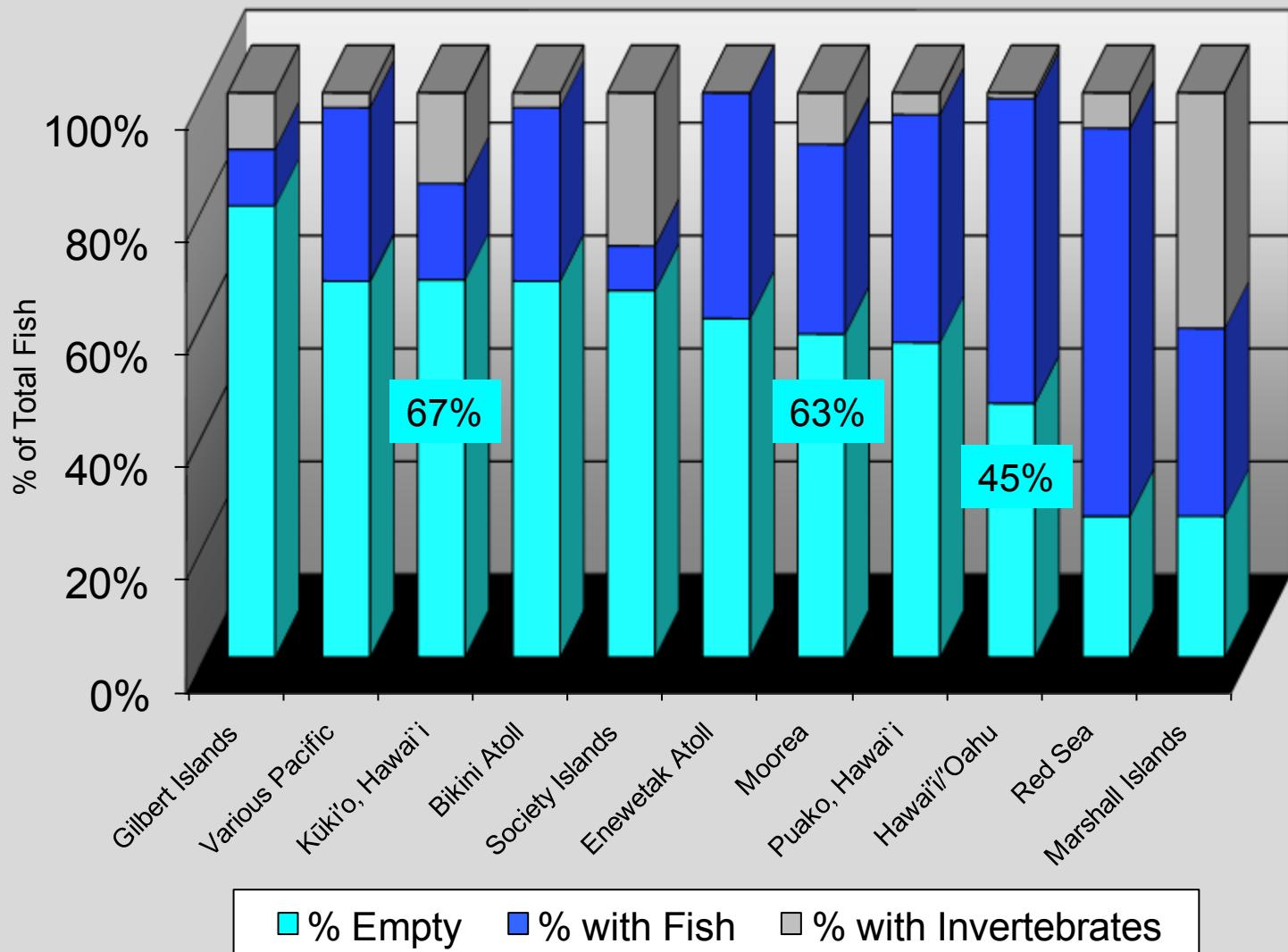
After Jan Dierking et al., 2008

Comparison of Annual Food Consumption



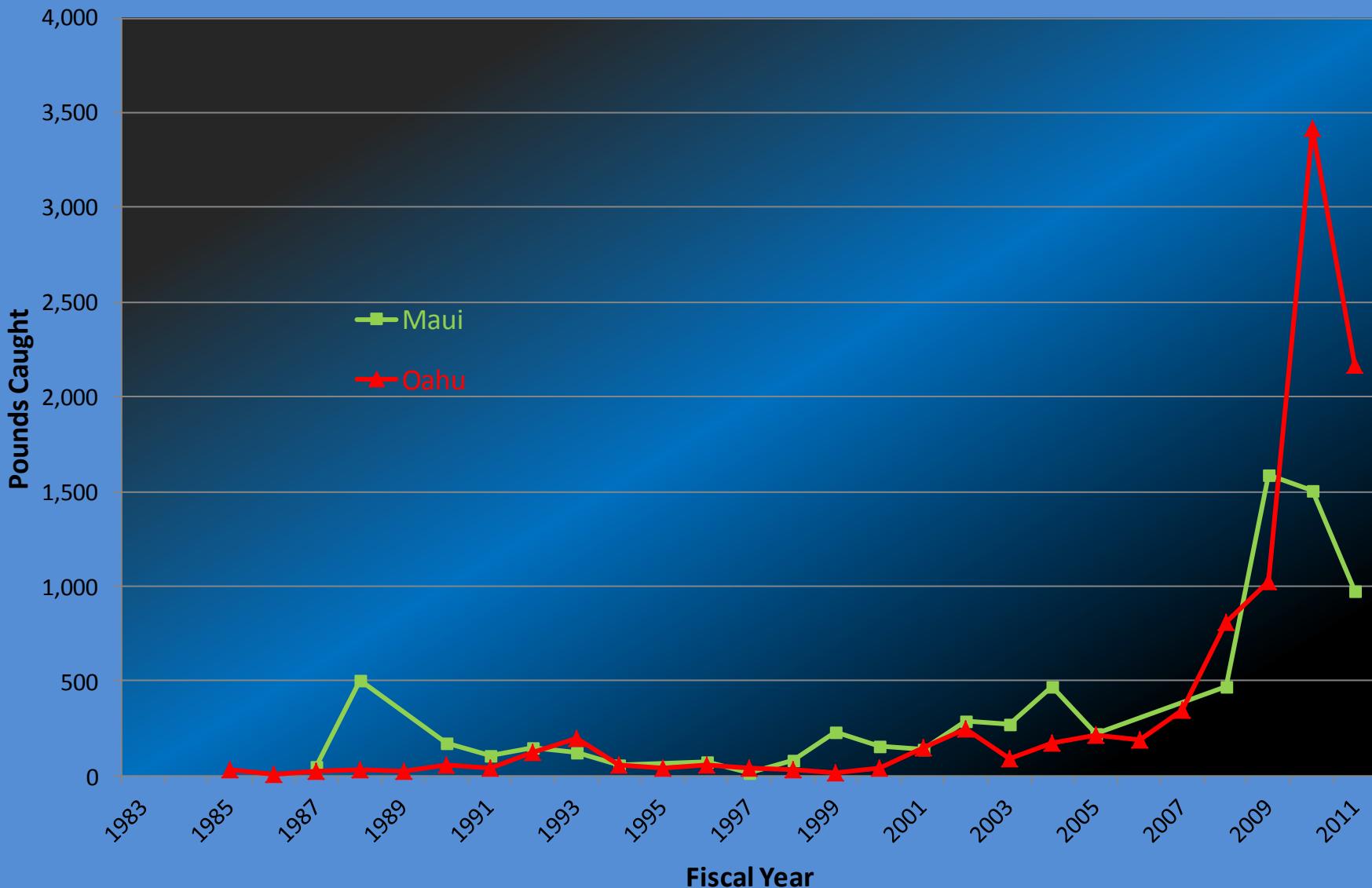
Pauly 1989, *Sudekum et al. 1991, ** Dierking 2007

Study of Roi Stomach Contents



Commercial Roi Landings

FY 1981-2011



DAR West Hawai'i



Ph.D. University of Hawai'i Mānoa

Brent Carman

B.S. Humboldt State University

Steve Cotton

B.S. University of Hawai'i Hilo

Laura Livnat

B.S. Washington State University

Kara Osada

B.S. University of Hawai'i Hilo

Camille Barnett

B.S. University of Hawai'i Hilo

